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RESEARCH REPORTS

January 16, 1959
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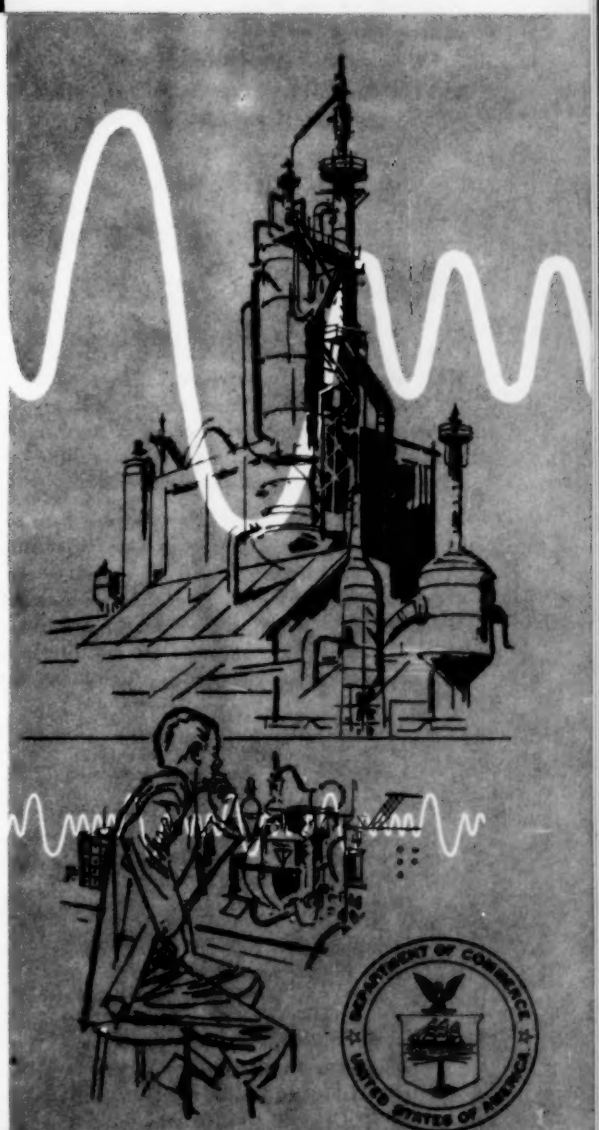

U. S. DEPARTMENT OF COMMERCE
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OFFICE OF TECHNICAL SERVICES
John C. Green, *Director*

U. S. DEPARTMENT OF COMMERCE
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U. S. DEPARTMENT OF COMMERCE

OFFICE OF TECHNICAL SERVICES

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Some measurements of the radioactivity of the air during 1957. (PB 151 049) $1.00 44

Structural evaluation of beryllium produced by several processes. (PB 151 263) $2.00 42

Symposium, technology of molybdenum and its alloys, held at Rackham Memorial Building, Engineering Society of Detroit, 18-19 Sep 1956. (PB 131 793) 75 cents 44

Test of removable swivel hooks for tire chains. (PB 151 290) 50 cents. 27

Theory of large-scale atmospheric diffusion and its application to air trajectories. Volume II: Downstream probability density function for various constant values of mean zonal wind. (PB 151 240) $5.00 10

Theory of large-scale atmospheric diffusion and its application to air trajectories. Volume III: Downstream probability density function for North America and Eurasia. (PB 151 241) $5.00 10

Use of sample quasi-ranges in estimating population standard deviation. (PB 151 266) $1.00 30

Vibrational manual for engineers. (PB 131 785) $1.00 23

Zinc-silver oxide cell low temperature operation without auxiliary heating. (PB 131 787) 75 cents 20

BIBLIOGRAPHY

Naval Avionics Facility, Indianapolis, Ind.
SELECTED BIBLIOGRAPHY ON PRECISION INSTRUMENT AND FLUID BEARINGS, WITH ANNOTATIONS, by Joel G. Weir. Mar 57, 105p. Memo. rept. no. 48.
Order from OTS $2.50 PB 131 791

This bibliography is the result of an extensive survey of the entire field of precision instrument ball bearings and fluid bearings. The survey was made to evaluate the current state of the art as one phase of a bearing research program. The bibliography is intended to include all material pertinent to precision instrument ball bearings and fluid bearings. The material included on jewel bearings is less complete. The material is indexed by author and by corporate name. It is divided into eleven categories by subject.

AGRICULTURE

Illinois U., Urbana.
PRIMARY PHYSICAL AND PHOTOCHEMICAL PROCESSES IN CELLS AND MODEL SYSTEMS, by Eugene Rabinowitch. Rept. no. 8, 1 Jan-31 Dec 1956. Jan 57, 10p. Contract N6ori-071(48).
Order from LC mi $1.80, ph $1.80 PB 132 319

Summary only; reports listed are not included.

BEHAVIORAL SCIENCES

Human Engineering

Aeronautical Instruments Lab., Naval Air Development Center, Johnsville, Pa.
EVALUATION OF AIRCRAFT INSTRUMENT DIAL MARKINGS FOR ACCIDENT INVESTIGATION, by E.M. Hudson. Mar 57, 24p. NADC ATL-5675.
Order from LC mi $2.70, ph $4.80 PB 135 183

This report presents the results of an investigation into the possible use of a thin coating of paint on the backs of instrument pointers as a reliable accident investigation aid. The original premise was that the instrument pointers would momentarily strike the face of the instrument on impact.

Institute for Applied Experimental Psychology, Tufts [U.] Medford, Mass.
HANDBOOK OF HUMAN ENGINEERING DATA. 2nd ed. rev. Nov 52, 656p. Contract N6ori-199(01); SDC-199-1-2a; NAVEXOS P-643.
Order from LC mi $11.10, ph $89.90 PB 100 814rev.

Includes supplements 1 and 2, consisting of revised pages. Compiles data helpful to engineers and equipment designers relative to the relation of the operator to the machine. Subjects treated are: the human machine, the human body, vision, audition, skin sensitivity, motor responses, psychological conditions as determinants of efficiency, intelligence, and learning.

Personnel and Training

Air Force Personnel and Training Research Center, Lackland AFB, Tex.
REFINEMENT AND VALIDATION OF AN AIMING-POINT IDENTIFICATION MOTION-PICTURE GROUP TEST, by Stephen A. Church. Dec 57, 21p. AFPTRC TN 57-142; AD-146 417.
Order from LC mi $2.70, ph $4.80 PB 134 738

The purposes of the research described in this report were to refine the stimulus presentation and scoring technique, and to find out the relationship, if any, between what the tests measured and intermediate validity criteria such as grades and ratings received during training.

American Inst. for Research, Pittsburgh, Pa.
DEVELOPMENT AND APPLICATION OF METHODS FOR DERIVING GENERALIZABLE COURSE CONTENT FOR ELECTRONIC EQUIPMENT, by Risdon J. Westen and Richard O. Peterson. Feb 58, 16p. Contract AF 18(600)1351. AFPTRC TR-58-8; AD-152-115.
Order from LC mi $2.40, ph $3.30 PB 134 361

This report briefly summarizes materials previously report in Technical Memorandums. On the assumption that various electronics maintenance specialties require common skills and knowledges, various methods to determine this information were tested for two types of aircraft (F-86D and F-102A). From lists of the common skills and knowledges, experimental coretraining programs were derived and performance measures devised for evaluation of trainee competence. A job-oriented approach proved more useful than an equipment-centered approach.

American Inst. for Research, Pittsburgh, Pa.
RESEARCH FOR EXPERIMENTAL INVESTIGATIONS OF TRANSFERABLE SKILLS IN ELECTRONIC MAINTENANCE, by Robert B. Miller and Edward B. Slebodnick. Jan 58, 25p. Contract AF 41(657)71; AFPTRC TR 58-2; AD-152 104.
Order from LC mi $2.70, ph $4.80 PB 134 360

Part I was designed to determine the extent to which special training in postulated nonspecific maintenance skills might lead to positive transfer in excess of that obtained from training in specific maintenance skills. Part II was designed to provide empirical tests of the application of principles of trouble-shooting and another hypothesized nonspecific factor,

concepts of data flow, to troubleshooting tasks. The major purpose of the study was to test the degree of transfer resulting from initial general training in troubleshooting principles and to measure the self-induction of "principles" by subjects who receive general training only in concepts of data flow.

Army medical Nutrition Lab., Denver, Colo.
METHOD OF CLUSTER ANALYSIS AND FACTOR ANALYSIS IN SELECTING A BATTERY OF PHYSICAL FITNESS TESTS, by Bernard P. Indik, John E. Brockett, and Gerhard J. Isaac. Nov 57, 22p. Rept. no. 216.
Order from LC mi $2.70, ph $4.80 PB 133 538

The methods of cluster analysis and factor analysis are illustrated as to how they apply to developing a physical fitness test battery. Twenty-six tests were given to sixty-one airmen and six factors of physical fitness were delineated, four of which could be well tested.

Human Resources Research Office, George Washington U., Washington, D.C.
FIGHTER I: STUDY OF EFFECTIVE AND INEFFECTIVE COMBAT PERFORMERS, by Robert L. Egbert, Tor Meeland and others. Mar 58, 92p. Contract DA 44-109-qm-650; Special rept. no. 130.
Order from LC mi $5.40, ph $15.30 PB 135 106

The purpose of this research was to obtain as complete a description as possible of the differences between soldiers who were judged to be effective combat performers in the Korean conflict. A 40-hour battery of tests was administered in Korea to 310 combat infantrymen who had previously been identified as fighters or non-fighters on the basis of descriptions of their recent combat behavior. The battery consisted of a wide variety of test instruments, including personality questionnaires and projective tests, sociometrics, a life history questionnaire and interview, and a number of objective tests designed to study various characteristics of the group. This study reports on the methodology of the research, describing the assessment procedures and the analyses performed on the data. Primary Field: Identification and Measurement of Intellectual, Emotional, Capacitative and Attitudinal Traits; Related Performance Evaluation. Secondary Field: Analysis of Occupations in Terms of Psychological Demands.

International Research Associates, Inc., New York.
STUDY OF PERSONAL AND MILITARY BACKGROUND FACTORS RELATED TO MARKSMANSHIP IN THE MARINE CORPS RESERVE (GROUND). Technical rept. no. 5 on Training Problems in the Marine Corps Reserve. May 57, 21p. Contract Nonr-1654(00).
Order from LC mi $2.70, ph $4.80 PB 134 459

This study was to identify among selected personal and performance characteristics of enlisted members of the Marine Corps Reserve (Ground) those characteristics which are: (1) significantly related to marksmanship with the .30 cal. rifle; and (2) determinants of marksmanship. The factors which are determinants of marksmanship may be relied on to predict future success or failure in marksmanship among new recruits. The data were taken from the official records of the Marine Corps Reserse during January of 1956. The characteristics of the sample are given in a table. (See also PB 134 460).

International Research Associates, Inc., New York.
STUDY OF PERSONAL AND MILITARY BACKGROUND FACTORS RELATED TO MAP READING IN THE MARINE CORPS RESERVE (GROUND). Technical rept. no. 6 on Training Problems in the Marine Corps Reserve, under Contract Nonr-1654 (00). May 57, 31p. Contract Nonr-1654(00).
Order from LC mi $3.00, ph $6.30 PB 134 460

The purpose was to identify those characteristics which are: (1) significantly related to map reading ability; and (2) determinants of map reading ability. The criterion was the G test, a general paper and pencil test on map reading. A copy of the test is given in Appendix A. A multiple correlation was then calculated between all of the items taken as a battery and the score on the map reading test, and a regression equation was set up as an instrument for predicting map reading ability on the basis of the seven characteristics. (See also PB 134 459).

Washington U., Seattle.
COLLEGE STUDENT'S CONCEPT OF EFFECTIVE TEACHING DETERMINED BY AN ANALYSIS OF TEACHER RATINGS, by Grace M. French. Feb 57, 69p. Sponsored by Carnegie Corp.; Contract Nonr-477(08); PH Grant M-743(02).
Order from LC mi $3.90, ph $10.80 PB 134 437

The purpose of this investigation was to discover what teacher characteristics, measured by a set of verbal statements, are related to students' high or low opinions of their college teachers. The design of the problem involved the determination of the relative contribution of each of a set of component judgments to an over-all complex judgment of teaching effectiveness.

Psychology

Advisory Group for Aeronautical Research and Development, Paris, France.
MEASUREMENT OF PILOT MENTAL EFFORT, by Sanford I. Cohen and Albert J. Silverman. May 57, 27p.
Order as AGARD 148 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

Presented at the Tenth Meeting of the Flight Test Techniques Panel, held from 20th-24th May 1957, London, Eng.

This paper discusses the factors which affect a pilot's ability to respond to situations demanding effort and methods of measuring his total psychophysiologic response. A description is given of some method and quantitative results obtained in research at the Aeromedical Laboratory of the Wright-Patterson Air Force Base.

Air Force Missile Development Center, Holloman AFB, N. Mex.
SENSORY REACTIONS RELATED TO WEIGHTLESSNESS AND THEIR IMPLICATIONS TO SPACE FLIGHT, by Grover J.D. Schock. Apr 58, 13p. APMDC TR-58-6; AD-135 012.
Order from LC mi $2.40, ph $3.30 PB 134 386

The implications of a sensory-starved environment have been reviewed and compared to conditions that will prevail in actual space flight. Recommendations for training for future space flight are presented.

Educational Testing Service, Inc., Princeton, N.J.
VALIDITY STUDY OF THE PICTORIAL ASSEMBLY TEST, by Roger B. Allison, Jr., Jun 57, 15p. Contract Nonr-694(00).
Order from LC mi $2.40, ph $3.30 PB 134 458

The purpose was to investigate the validity of the Pictorial Assembly Test. This test, classifiable as a group administered, paper-and-pencil test, was constructed to duplicate insofar as possible the assembly operations required by the Breech Block Performance Test but substituting words, phrases, and photographs for the breech block gear and the assembly sequence.

Engineering Research Inst., U. of Michigan, Ann Arbor.
EFFECT OF VOCABULARY SIZE ON ARTICULATION SCORE, by D.M. Green and T.G. Birdsall. Jan 58, 21p. Contract AF 19(604)2277; Technical Rept. no. 81; Rept. no. 2659-1-T; AFCRC TN 57-58; AD-146 759.
Order from LC mi $2.70, ph $4.80 PB 134 395

Iowa State U., Iowa City.
EXPERIMENTAL EVIDENCE ON THE RELATION BETWEEN PERFORMANCE LEVEL IN EYELID CONDITIONING AND ANXIETY (DRIVE) LEVEL, by Kenneth W. Spence and Leonard E. Ross. Technical rept. no. 5 on Studies of Influence of Motivation on Performance in Learning. For reports nos. 1-4 see PB 118095, 118096, 120047, 124012. Jun 57, 12p. Contract N9onr-938(02).
Order from LC mi $2.70, ph $4.80 PB 134 464

The present paper summarizes the experimental evidence bearing on the relation between performance level in eyelid conditioning and the level of anxiety (drive). The data indicate that high A subjects perform at a higher level than low A subjects and that the difference increases as a function of the training trials. The findings were also discussed in relation to a number of methodological problems.

Maryland U., College Park.
CLOZE PROCEDURE IN THE EVALUATION OF PROSE STORIES VARYING IN ADJECTIVE - VERB QUOTIENT, by Charles N. Cofer. July 57, 7p. Contract Nonr-595(04); Technical rept. no. 13.
Order from LC mi $1.80, ph $1.80 PB 134 563

Maryland U., College Park.
INSTRUCTIONAL SET AND ACCURACY OF RECALL FOR THE BARTLETT GHOST STORY, by Charles N. Cofer. July 57, 11p. Contract Nonr-595(04); Technical rept. no. 12.
Order from LC mi $2.40, ph $3.30 PB 134 562

Maryland U., College Park.
ROLE OF ADJECTIVES AS CONTEXT IN THE ORGANIZATION OF MEANINGFUL MATERIAL: TESTS OF THEORETICAL IMPLICATIONS DERIVED FROM A MEDIATION MODEL, by Richard C. Gonzalez and Charles N. Cofer. June 57, 9p. Contract Nonr-595(04); Technical rept. no. 15.
Order from LC mi $1.80, ph $1.80 PB 134 456

Minnesota U., Minneapolis.
CORRELATION AMONG HOMOGENEOUS AND EMPIRICAL KEYS OF THE NAVY VOCATIONAL INTEREST INVENTORY, by Kenneth E. Clark, Diane R. Albitz and Warren T. Norman. Apr 57, 23p. Contract Nonr-710(17); Technical rept. no. 7.
Order from LC mi $2.70, ph $4.80 PB 133 550

This report summarizes one part of the program by examination of the correlations among several sets of empirical and homogeneous keys. These correlations attract interest because they give some insights into relationships between Navy and civilian specialty groups.

Naval Research Lab., Washington, D.C.
INTERACTIONS BETWEEN DISPLAY GAIN AND TASK-INDUCED STRESS IN MANUAL TRACKING SYSTEMS, by W.D. Garvey and Jean B. Henson. Oct 58, 6p. NRL 5204.
Order from OTS 50 cents PB 151 046

An experiment was conducted to determine how the performance of man-machine systems is affected by factors which stress or overload the human operator. Five systems, all of which had the same dynamics but differed in display magnification, were employed. Operators were given considerable training on all five systems, after which they were required to control the systems under a series of stressful conditions. Performance was measured both in terms of system error and error at the display. The results indicated that stress increased error in all systems, but the order of merit of the various systems was unchanged by stress. The results are discussed in terms of their relevance to the

study of man-machine systems. The pitfalls of purely psychological interpretations of the behavior of complex tracking systems are outlined.

Operational Applications Lab., Air Force Cambridge Research Center, Washington, D.C.
NUMERALS, NONSENSE FORMS AND INFORMATION, by E.T. Klemmer and J.P. Loftus. Feb 58, 22p. 10 refs. AFCRC TR 57-2; AD 110 063.
Order from LC mi $2.70, ph $4.80 PB 134 400

Are arabic numerals seen and reported better than a random pattern of lines of similar complexity? How do numerals and the related class of forms compare with other classes of stimuli when performance is measured by the amount of information transmitted by S? How much more information can S perceive than transmit? To determine whether well-learned symbols are perceived, discriminated, and remembered better than nonsense forms, the stimuli used were a series of arabic numerals and a logically related class of nonsense forms presented tachistoscopically to a group of 10 Ss required to make discriminative responses.

Princeton U., N.J.
COMPARATAL DISPERSION, A MEASURE OF ACCURACY OF JUDGMENT, by Harold Gulliksen. June 57, 26p. In cooperation with Educational Testing Service, Inc.; Contract Nonr-1858(15); jointly supported by ONR and NSF Grant G-642.
Order from LC mi $2.70, ph $4.80 PB 134 449

It is shown that the comparatal dispersion for paired comparison judgments may be used to measure accuracy of judgments made by paired comparisons. A simultaneous solution for scale values and ratios of comparatal dispersions is presented.

Princeton U., N.J.
RELIABILITY FOR THE LAW OF COMPARATIVE JUDGMENT, by Harold Gulliksen and John W. Tukey. May 57, 25p. In cooperation with Educational Testing Service, Inc.
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Texas U., Austin.
EFFECTS OF SPEED AND DIFFICULTY LEVEL ON THE FACTORIAL CONTENT OF SPATIAL TESTS, by Dorothy Anne Fruchter, Leland D. Brokaw, and Jane McReynolds. June 57, 21p. Contract AF 33 (038) 11046; AFPRC TN 57-89; AD-134 232.
Order from LC mi $2.70, ph $4.80 PB 134 864

To provide sections of test items to measure spatial abilities, it is necessary to clarify concepts of the psychological structure of the spatial domain. This paper reports an investigation seeking to determine: (1) the effect of speeding on the factorial content of spatial tests; (2) the effect of item difficulty level on the factorial content of spatial tests; (3) the relative factorial content of right and wrong scores from speeded spatial tests; and (4) the factorial content of a newly devised spatial test.

BIOLOGICAL SCIENCES

Alabama U., University.
DEVELOPMENT OF FLUORESCENT ANTIBODIES AS TECHNIQUES FOR DETECTION AND INDENTIFICATION OF BACTERIA AND VIRUSES, by Mildr A. Engelbrecht and Margaret Green. Quarterly rept. no. 5, 1 Feb-30 Apr 56. May 56, 7p.
Order from LC mi $1.80, ph $1.80 PB 134 40

Anatomy and Physiology

California U., Los Angeles.
QUANTITATIVE STUDY OF EVAPORATION FROM THE HUMAN BODY DURING SHORT EXPOSURES T VARIOUS TEMPERATURES, HUMIDITIES, PRESSURES, AND MASS VELOCITIES, by Joseph W. McCutchan and Craig L. Taylor. June 55, 46p. Contract AF 33(616)32; WADC TN 55-522.
Order from LC mi $3.30, ph $7.80 PB 135 13

This report provides an example of an economical design of a physiological experiment using the Lat Squares technique. Variations in human perspiration, evaporation from the skin, and skin and rect temperatures are expressed as functions of the environmental variables of air temperature, wate vapor pressure, pressure, and mass velocity over the specified ranges.

Quartermaster Research and Engineering Center Natick, Mass.
MEASUREMENT OF THE RATES OF EXCRETION OF SWEAT SOLUTES UNDER PHYSIOLOGICAL CONDITIONS, by R.B. Barrueto, M. Mager and David E. Bass. Dec 57, 14p. Technical rept. no. EP-78.
Order from LC mi $2.40, ph $3.30 PB 134 46

An apparatus is described which permits the study of rates of excretion of sweat solutes under physiological conditions from an arm, and which permits regulation of skin temperature independent of ambient conditions. The apparatus permits the collect from the arm, of all sweat water separately from the associated solutes.

School of Aviation Medicine, Randolph AFB, Tex
FACTORIAL STUDY OF ENVIRONMENTALLY INDUCED METABOLIC CHANGES IN RATS, by Henry B. Hale and Roy B. Mefferd, Jr. Feb 58, 16p. Rept. no. 58-54.
Order from LC mi $2.40, ph $3.30 PB 134 45

Metabolic effects of chronic exposure to combinations of adverse environmental influences were studied in rats. During exposures lasting 12 weeks rats were subjected to the barometric pressure equivalent to 18,000 feet altitude at temperatures

ranging from 5° to 34° C. Controls at the various temperatures were held at ground level (700 feet above sea level). Biweekly observations showed that metabolic functions (water, electrolyte, and nitrogen) were influenced primarily by the thermal factors, but altitude effects could also be distinguished. Observations are reported for survival, body weight change, water and food intake, urine volume, and the urinary excretion of Na, K, PO_4, Mg, Ca, urea, uric acid, creatinine, taurine, and ten amino acids.

School of Aviation Medicine, Randolph AFB, Tex.
SODIUM AND POTASSIUM LEVELS OF HUMAN WHOLE SALIVA COLLECTED WITHOUT EXOGENOUS STIMULATION, by Ira L. Shannon. Feb 58, 7p. AFSAM 58-49.
Order from LC mi $1,80. ph $1.80 PB 134 362

Wayne State U., Detroit, Mich.
EXPERIMENTAL STUDY OF CERTAIN PATHWAYS IN THE CENTRAL NERVOUS SYSTEM, by Ernest Gardner. Final rept. Jan 57, 8p. Contract Nonr-823(00).
Order from LC mi $1.80, ph $1.80 PB 132 487

Pathology

Armed Forces-NRC Committee on Hearing and Bio-Acoustics, Washington, D.C.
MONITORING AUDIOMETRY AND THE MEDICAL DISPOSITION OF CASES OF HEARING LOSS. Final rept. of working group 25. [1957], 29p. Contract Nonr-1151(01); Technical rept. no. 11; CHABA rept. no. 6.
Order from LC mi $2.70, ph $4.80 PB 134 381

This report summarizes the medical principles on which monitoring audiometry is based and outlines a general plan for medical disposition of cases of hearing loss that is consistent with these principles.

School of Aviation Medicine, Randolph AFB, Tex.
EFFECT OF EXPOSURE TO SIMULATED HIGH ALTITUDES ON ANAPHYLAXIS IN MICE, by William E. Harris and John D. Fulton. Jan 58, 6p. AFSAM 58-42.
Order from LC mi $1.80, ph $1.80 PB 134 366

Pharmacology and Toxicology

Army Chemical Warfare Labs., Army Chemical Center, Md.
CHRONIC TOXICITY OF GA IN DOGS, by W.C. Wescoe, R.E. Green and others. Nov 47, declassified 19 Oct 55. 19p. Medical Div. rept. no. 122.
Order from LC mi $2.40, ph $3.30 PB 135 140

The daily administration of small doses of GA produced a syndrome of neuro-muscular irritability and fatiguability which progressed to death if the agent were not withdrawn. GA apparently attacked specific esterase preferentially to the non-specific. Blood chemistry (NPN, total nitrogen, serum proteins and sugar) and the formed elements of the blood were not affected by the compound.

Army Chemical Warfare Labs., Army Chemical Center, Md.
SOME PHARMACOLOGICAL EFFECTS OF SODIUM DINITROCYANOMETHIDE, by Edmund F. Murtha, Dorothy E. Stabile, and J. Henry Wills. Mar 58, 28p. CWLR 2211.
Order from LC mi $2.70, ph $4.80 PB 135 180

Studies of the pharmacological effects caused by sodium dinitrocyanomethide were performed on dogs, cats, and rabbits. Intravenous doses of 100 mg./kg. cause cardiac effects with associated hypotension. Although other mechanisms of action are not excluded by this investigation, it appears that the cardiac effects and associated hypotension are major pharmacological effects of sodium dinitrocyanomethide intoxication. Respiratory depression may also play a part in the lethal effects. The presence of cyanide ion in the circulating blood, following intravenous injections of this chemical, suggests another possible important mechanism of action.

Radiobiology

School of Aviation Medicine, Randolph AFB, Tex.
IRON-59 METABOLISM AS AN INDEX OF HEMATOPOIETIC DAMAGE AND RECOVERY IN MONKEYS EXPOSED TO NUCLEAR RADIATION, by Quentin L. Hartwig, George S. Melville, Jr., and others. Mar 58, 7p. Rept. no. 58-59.
Order from LC mi $1.80, ph $1.80 PB 134 453

Monkeys exposed to ionizing nuclear radiations were studied for changes in iron metabolism. Repeating the iron-59 injection technic 34 days after exposure indicated repair and active erythropoiesis in survivors. Postexposure implications of iron-59 incorporation levels and plasma iron values are discussed.

School of Aviation Medicine, Randolph AFB, Tex.
LATENT EFFECTS OF CHRONIC WHOLE-BODY IRRADIATION ON THE PERFORMANCE OF MONKEYS ON THE SPATIAL DELAYED-RESPONSE PROBLEM, by A.A. McDowell and W. Lynn Brown. Apr 58, 4p. Rept. no. 58-50.
Order from LC mi $1.80, ph $1.80 PB 134 450

The results of the present experiment demonstrated that: (1) The hypothesis of a facilitation of delayed-response performance by monkeys as a latent effect of whole-body irradiation is tenable. (2) Normal monkeys can and do perform as efficiently at some points in time as chronic irradiated monkeys, but they appear to suffer interference from stimulus factors extraneous to solution of the problem at hand.

School of Aviation Medicine, Randolph AFB, Tex.
LETHALITY IN THE RAT AS A FUNCTION OF DOSE PATTERN, by Quentin L. Hartwig, George S. Melville, Jr., and Thomas P. Leffingwell. Mar 58, 4p. Rept. no. 58-51.
Order from LC mi $1.80, ph $1.80 PB 134 451

Rats exposed 7 days to a chronic field of 2 r/hour of Co^{60} gamma rays immediately prior to or immediately after an acute dose of 800 r of Co^{60} gamma rays failed to exhibit a significant difference in either a 30-day or 90-day mortality. When compared to a group of rats receiving only an acute dose of 800 r of Co^{60} gamma rays, both acute-chronic groups evidenced different mortalities; however, these differences were not statistically significant.

CHEMISTRY

Inorganic Chemistry

Battelle Memorial Inst., Columbus, Ohio.
VAPOR PRESSURES OF TITANIUM TETRAFLUORIDE AND TITANIUM TETRABROMIDE, by E.H. Hall, J.M. Blocher, and I.E. Campbell. June 57, 27p. Contract Nonr-1120(00).
Order from LC mi $2.70, ph $4.80 PB 135 276

Materials Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
LITERATURE SURVEY ON THE PREPARATION AND PROPERTIES OF INORGANIC POLYMERS BASED ON BORON, PHOSPHORUS OR GERMANIUM, by E.J. Kupchik. July 52, 10p. WCRTE TN 52-37; AD- 5351.
Order from LC mi $1.80, ph $1.80 PB 135 198

An extensive program has been underway for some time to develop fluorocarbon polymers which will function satisfactorily in problem applications, but comparatively little work has been done in the field of inorganic polymers (other than those based on silicon which have good ozone resistance and thermal stability but lack adequate resistance to fuels and oils, and are inferior to other non oil-resistant rubbers with respect to mechanical properties). This survey is an attempt to uncover areas in the inorganic field which should be investigated as potential sources of hydrolytically stable polymers of exceptional solvent resistance and thermal stability; such new polymers would find usage as elastomers, plastics for structural applications, hydraulic fluids, heat transfer media, etc. This survey is specifically concerned with the possibility of preparing useful polymers based on boron, phosphorus, or germanium.

Miami U., Coral Gables, Fla.
RELATIVISTIC EFFECTS IN THE COHESIVE ENERGIES OF THE ALKALI METALS, by Joseph Callaway, Roger D. Woods, and V. Sirounian. May 57, 22p. Contract Nonr-840(06); Technical rept. no. 4.
Order from LC mi $2.70, ph $4.80 PB 134 582

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
BERYLLIUM NITRIDE, by Walter G. Baxter. Aug 47, declassified 10 Sep 48. 5p. NEPA-278-ERM-17; AD-149 839.
Order from LC mi $1.80, ph $1.80 PB 135 659

Organic Chemistry

Akron U., Ohio.
BRANCHING REACTIONS IN THE POLYMERIZATIO OF VINYL ACETATE, by Maurice Morton and Irja Piirma. Rept. for 1 Jan - 31 Dec 57. Mar 58, 31p Contract AF 33(616)3861; WADC TR 58-119; AD- 151 124.
Order from OTS $1.00 PB 151 245

A study has been carried out to determine the transfer constants of poly(methyl acrylate) and poly(vinyl acetate) in their respective homopolymerizations, as well as in graft copolymerizations. The method used was the polymerization of the monomers in the presence of varying amounts of oligomers, followed by careful separation of the resulting polyme The effect of oligomer end-groups was determined by using oligomers of different molecular weight (1500-5000).

RIAS, Inc.
ENTROPY OF FUSION OF LONG CHAIN HYDROCARBONS, by R.H. Aronow (thesis), L. Witten, and Donald H. Andrews. Sep 57, 19p. Contract AF 18(600)765; AFOSR TN 58-88; AD-148 138.
Order from OTS 50 cents PB 131 758

An analysis is made of the high entropy of fusion of long chain paraffins attributing that entropy to the onset at melting of freedom of the molecule to undergo hindered rotation about each carbon to carbon bond. The theoretical results are compared with the experimental observations. The entropy of fusion of heavy paraffins yields information concerning the rotational energy levels of the molecules. An empirical relationship is stated connecting the energy levels of the molecule with the melting temperature of the molecule.

Physical Chemistry

Bureau of Mines, Pittsburgh, Pa.
EVIDENCE FOR THE WRINKLED CONTINUOUS LAMINAR WAVE CONCEPT OF TURBULENT BURNING, by J.K. Richmond, W.F. Donaldson and other Oct 57, 27p. Contract CSO-680-57-14; Technical rept. no. 1231; AFOSR TN 57-676; AD-136 666.
Order from LC mi $2.70, ph $4.80 PB 134 308

Correlation which oscillograms show between the light from a steady laminar flame and the minimum light transients from a turbulent flame strongly indicated that the wrinkled laminar flame model is pertinent over the entire range of conditions described.

City Coll. of the City of New York.
CATHODIC FORMATION OF METALLIC HYDRIDES, by Hugh W. Salzberg, Fred. Mies, and Lawrence Gastwirt. n.d. 52p. Contract Nonr-1597(02).
Order from LC mi $3.60, ph $9.30 PB 133 328

The objectives of this study were to obtain information about the mechanism of hydride formation at cathodes, to elucidate the mechanism or mechanisms of hydrogen evolution at cathodes and to apply the above information to the problems of the negative plate of the lead-acid storage battery. The hydrides studied were those of tin and lead.

Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
ANALYSIS OF STEADY, FINITE-AMPLITUDE CELLULAR FLAMES, by George Markstein. Apr 57, 41p. Contract N6ori-105, T.O. 3; CAL TR 71-P.
Order from LC mi $3.30, ph $7.80 PB 134 420

Presented at the Heat Transfer and Fluid Mechanics Institute, California Institute of Technology, June 19-21, 1957.

Diamond Ordnance Fuze Labs., Washington, D.C.
MEASUREMENT OF HEAT EVOLVED BY THERMITE REACTIONS DURING CALORIMETRIC MEASUREMENTS, by John P. Gibbons. Mar 57, 24p. Technical rept. no. 494.
Order from LC mi $2.70, ph $4.80 PB 135 145

Factors which might affect the heat evolved by the combustion of zirconium-barium chromate mixtures have been investigated. The heat evolved by the combustion of these mixtures in the DOFL or Parr Peroxide Calorimeters is not affected by variations in the normal calorimetric procedure. Loading the sample with a pressure of 1000 psi before confinement appears to increase the heat evolved.

General Electric Research Lab., Schenectady, N.Y.
MASS SPECTROMETER STUDIES OF BORON HYDRIDE DECOMPOSITION, by Francis J. Norton. Mar 49, 38p.
Order from LC mi $3.00, ph $6.30 PB 135 190

The decomposition of boron hydrides has been followed in detail by the mass spectrometer. The hydrides B_2H_6, B_4H_{10}, B_5H_9 and B_5H_{11} were studied from 60° to 120°C and from 3 to 123 mm pressure. A quantitative picture of the complicated way each pure hydride decomposes is presented.

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
HIGH TEMPERATURE REACTIONS IN THE SYSTEM SiC-SiO_2, by Thomas H. Elmer. Mar 50, 14p. NEPA 1770.
Order from LC mi $2.40, ph $3.30 PB 130 432

Plastics Lab., Princeton, U., N.J.
NON-UNIFORM FIELD EFFECTS IN POORLY CONDUCTING MEDIA, by Herbert A. Pohyl. May 58, 16p. Contract DA 36-039-sc-70154; Rept. no. 11B; Technical rept. no. 50B.
Order from LC mi $2.40, ph $3.30 PB 135 109

A simplified theory of the behavior of suspended polymer particles in a real dielectric is presented. It is becoming well known that non-uniform fields exert an attractive force of interesting magnitude upon particles of high dielectric constant suspended in a liquid medium of lower dielectric constant. It is shown that, in a real dielectric, the initial attraction to the central electrode felt by all particles due to the non-uniform field and its polarizing induction is gradually overcome by the repulsive effects of charge accumulated on the particles due to ionic condition in the liquid. The 'reversal time' for the particle motion is calculated and shown to be reasonable.

Politecnico di Milano. Italy.
RESEARCH ON ANODIC AND CATHODIC BEHAVIOR OF METALS, by Roberto Piontelli. Abridged review of work. Sep 56, 13p. Contract AF 61(514)733-c; Technical note no. 7; AFOSR TN 56-546.
Order from LC mi $2.40, ph $3.30 PB 134 431

Discusses the anode and cathode overvoltages of polycrystalline Au, Ag, Cu, Sn, Pb, Ti, Zn, Cd, In, Ni, Mg; the electrode behavior of metals in fused salts and especially of aluminum in cryolite-alumina baths and the electrochemical behavior of metallic single crystals.

EARTH SCIENCES

Air Force, Bedford, Mass.
ESTIMATE OF THE MAXIMUM RANGE OF DETECTABILITY OF SEISMIC SIGNALS, by N.A. Haskell. Mar 57, 55p. GRD SG-87; AFCRC TN 57-202; AD-117 198.
Order from LC mi $3.60, ph $9.30 PB 134 405

By using Lamb's expressions for the amplitude of seismic waves generated by a concentrated force applied at a point on the free surface of a solid body, together with available data on elastic wave attenuation in rocks and soil, and an estimate of the minimum seismic background noise level, the maximum theoretical ranges of detectability of seismic signals in typical earth materials are calculated in terms of the peak force and total impulse exerted by the

source. Both theory and practice indicate that ranges of detectability of more than 1000 miles imply sources of earthquake or atomic bomb magnitude.

Land Locomotion Research Lab., Detroit Arsenal Center Line, Mich.
STUDY OF SNOW VALUES RELATED TO VEHICLE PERFORMANCE, by William L. Harrison, Jr. Dec 57, 63p. Contract DA 04-495-ORD-896; OTAC 23.
Order from LC mi $3.90, ph $10.80 PB 134 385

Appendix: Preliminary analysis of Gaspardo snow test data, by L.P. Holliday, W.J. Dixon, C.H. Gordon, C.P. Ciska, (Planning Research Corporation).

The results of studies conducted were as follows: The variation of sinkage speeds within 200 inches per minute has no effect on sinkage parameters; accurate predictions of drawbar-pull vs. slip curves can be computed with the seven physical snow values; statistical methods can be employed for characterization of large areas where snow values vary due to the non-homogeneity of the snow cover.

Radio Corp. of America, Camden, N.J.
GENERALIZED EARTH'S CURVATURE CORRECTION, by Bruce U. Glass. June 55, 7p. Technical rept. no. 14.
Order from LC mi $1.80, ph $1.80 PB 134 798

Climatology and Meteorology

Air Force Cambridge Research Center, Bedford, Mass.
THEORY OF LARGE-SCALE ATMOSPHERIC DIFFUSION AND ITS APPLICATION TO AIR TRAJECTORIES. VOLUME II. DOWNSTREAM PROBABILITY DENSITY FUNCTION FOR VARIOUS CONSTANT VALUES OF MEAN ZONAL WIND, by Samuel B. Solot and Eugene M. Darling, Jr. June 58, 371p. AFGRD P58, v. 2; AFCRC TR 58-228, v. 2; AD-152 570.
Order from OTS $5.00 PB 151 240

Air Force Cambridge Research Center, Bedford, Mass.
THEORY OF LARGE-SCALE ATMOSPHERIC DIFFUSION AND ITS APPLICATION TO AIR TRAJECTORIES. VOLUME III. DOWNSTREAM PROBABILITY DENSITY FUNCTION FOR NORTH AMERICA AND EURASIA, by Samuel B. Solot and Eugene M. Darling, Jr. June 58, 384p. AFGRD P58, v. 3; AFCRC TR 58-228, v. 3; AD 152 571.
Order from OTS $5.00 PB 151 241

Deutscher Wetterdienst, Frankfurt.
CURVATURE- AND SHEARING-VORTICITY EQUATION; THE DIRECTION- AND SPEED-DIVERGENCE EQUATION, by G. Hollmann. Rept. on Research on Objective Weather Forecasting. [1957], 17p. Contract AF 61(514)735-C; Technical note no. 6; AFCRC TN 57-487; AD-117 252.
Order from LC mi $2.40, ph $3.30 PB 133 808

Florida State U., Tallahassee.
OBSERVATIONAL PROBABILITIES AND UNCERTAINTY RELATIONS FOR METEOROLOGY, by Thomas A. Gleeson. June 58, 26p. Contract AF 19(604)753; AFCRC TN 58-410.
Order from LC mi $2.70, ph $4.80 PB 135 250

The probability that an atmospheric feature of a given size will be observed in a region with a network of stations randomly distributed relative to the feature is shown to be a function of the feature and region sizes, and the number of stations. The function is developed to give the probability of observing the feature in a network of stations with varying observational capabilities, and the probability of observing several features simultaneously. Applications to aircraft reconnaissance, network design, climatology, and prediction are discussed, and effects of a variation in network density are considered quantitatively.

Johann Wolfgang Goethe Universität, Frankfurt, Germany.
RELATIONS BETWEEN ICE NUCLEI AND PARTICLES OF ATMOSPHERIC AEROSOLS, by Hans-Walter Georgii. May 57, 32p. Contract AF 61(514)927; AFCRC TN 57-497; AD-133 601.
Order from LC mi $3.00, ph $6.30 PB 134 404

The report summarizes the results of current measurements of natural freezing nuclei carried out in a mixing cloud chamber. Measurements of the concentration of atmospheric condensation nuclei in different size ranges separately were carried out. The investigations showed the following new results. The results are valid for the freezing nuclei becoming active within the temperature range $0^{o}C$ to $-30^{o}C$. The concentration of freezing nuclei shows an annual trend with a maximum concentration during winter. The existence of a diurnal trend of the freezing nuclei concentration was detected. There exists a good correlation between number of freezing nuclei and number of "large" condensation nuclei, but no relation between freezing nuclei and Aitken nuclei. The importance of the "large" condensation nuclei for the ice nucleation in supercooled clouds is supported by direct impaction methods.

Massachusetts Inst. of Tech., Cambridge.
NONLINEAR VERSUS LINEAR OBJECTIVE WEATHER PREDICTION, by Edward N. Lorenz. Scientific rept. no. 6 on Statistical Forecasting Project. Apr 58, 43p. Contract AF 19(604)1566; AFCRC TN 58-299; AD-152 549.
Order from LC mi $3.30, ph $7.80 PB 134 401

A prediction formula is called linear if an observab

predictand is expressed as a linear combination of observable predictors. Some of the more promising approaches to nonlinear prediction formulas are enumerated.

Naval Research Lab., Washington, D.C.
PRELIMINARY EXPERIMENTS USING CARBON BLACK FOR CLOUD MODIFICATION AND FORMATION, by F.W. van Straten, R.E. Ruskin, J.E. Dinger, and H.J. Mastenbrook. Oct 58, 28p. NRL 5235.
Order from OTS 75 cents PB 151 183

Speculations concerning the origin of tropical rain led to a hypothesis for a method of cloud modification or formation based on artificially changing the heat distribution in limited parts of the cloud or atmosphere. Flight experiments were carried out in which small amounts of carbon black were dispensed into warm cumulus clouds. These experiments were based on the assumption that the absorption of solar radiation by the carbon black would alter the heat distribution in the cloud. Seven clouds were thus "carboned," and on the basis of observations by trained meteorologists, pilots, and the subsequent analysis of photographs, convincing evidence is presented that each cloud dissipated as a consequence of treating it with 1-1/2 to 6 pounds of carbon black. Clouds were caused to form in clear humid air by dispensing carbon black at the approximate altitude of existing cumulus cloud bases in nearby areas, presumably by initiating thermal updrafts due to the solar heating, thus raising the moisture to an altitude where condensation starts.

Quartermaster Research and Engineering Center, Natick, Mass.
HAIL SIZE AND DISTRIBUTION, by Blanche B. Hull. Beb 57, 95p. Technical rept. no. EP-83.
Order from LC mi $5.40, ph $15.30 PB 133 578

Basic information is provided on frequency of occurrence and geographical distribution of hail throughout the world. Principal theories of hail growth and the factors which limit the maximum size of hailstones are discussed.

Quartermaster Research and Engineering Center, Natick, Mass.
HIGH TEMPERATURES AT HIGH ELEVATIONS, by Jane Westbrook. Jan 58, 17p. Research rept. EA-9.
Order from LC mi $2.40, ph $3.30 PB 135 270

High temperatures observed at 1000 weather stations above 3000 feet in elevation were studied to determine the joint occurrence of high temperatures at high elevations.

Wisconsin U., Madison.
THE MARCH OF THE SEASONS, by Reid A. Bryson and James L. Lahey. Final rept. Mar 58, 84p. Contract AF 19(604)992; AFCRC TR 58-223; AD-152 500.
Order from LC mi $4.80, ph $13.80 PB 135 179

The objective was to study large scale weather patterns as related to singularities in the general circulation. This final summary attempts to exact from preceding work the materials and ideas pertinent to the theme of primary singularities and the march of the seasons, and summarize them in form intelligible to the meteorologist coming upon the ideas without familiarity with previous reports.

Oceanography

Beach Erosion Board, Corps of Engineers, Washington, D.C.
MODIFICATION OF THE QUADRATIC BOTTOM-STRESS LAW FOR TURBULENT CHANNEL FLOW IN THE PRESENCE OF SURFACE WIND-STRESS, by R.O. Reid. Feb 57, 45p. Contracts Cwb-8717 and DA 49-055-Civ-eng-56-4; TM 93.
Order from LC mi $3.30, ph $7.80 PB 133 287

A generalized formula for velocity profile and bottom stress is derived which takes the influence of surface stress into account. The theory applies to quasi-steady flow over a hydrodynamically rough stream bed and makes use of Montgomery's (1943) generalization of the Prandtl-von Karman mixing length theory, where both stress and mixing length are continuous functions of elevation, from the stream bed to the surface.

Control Systems Lab., U. of Illinois, Urbana.
CAPACITANCE PROBE FOR RECORDING WATER WAVES, by Clive G. Whittenbur. Dec 56, 21p. Contract DA 36-039-sc-56695. Rept. no. 84.
Order from LC mi $2.70, ph $4.80 PB 133 813

A convenient, reliable and linear method of recording wave height, or wave energy resident in any band of the spectrum of small waves, in conjunction with the local wind speed is described. The method is based upon the detection of the capacity change of a small capacitance probe immersed in water of variable height. The probe capacity, linearly dependent of wave height, modulates the repetition rate of a blocking oscillator which generates a Miller run-down waveform and also triggers a boxcar to measure the run-down depth. The latter provides an output proportional to wave height limited by interference of the smallest waves by the probe.

Narragansett Marine Lab., U. of Rhode Island, Kingston.
FOULING PROJECT, by Donald J. Zinn, Richard D. Wood, and Harold Berkowitz. Final rept. June 57, 52p. Contract Nonr-396(06).
Order from LC mi $3.60, ph $9.30 PB 134 982

The biology of fouling organisms was studied,

particularly with regard to their growth rates, succession, and stratification. Special attention has been given the fouling of mines, the temporal succession of fouling organisms in the community, the effect of location on the amount of fouling, and the composition of fouling communities in relation to vertical stratification. (See also PB 126 562, 132 633)

Texas A. and M. Coll., College Station.
OCEANOGRAPHIC SURVEY OF THE GULF OF MEXICO, by Kenneth H. Drummond. Annual rept. 1 May 56-30 Apr 57. May 57, 42p. Contract N7onr-487(02); Ref. no. 57-15A.
Order from LC mi $3.30, ph $7.80 PB 134 352

For annual reports 1953/54-1954/55 see PB L18 412 and 124 013.

University of Southern Calif., Los Angeles.
SEDIMENTS OF SHALLOW PORTIONS OF EAST CHINA SEA AND SOUTH CHINA SEA, by Hiroshio Niino and K.O. Emery. [1956] 108p. Contract Nonr-228(12); In cooperation with Tokyo U. of Fisheries.
Order from LC mi $5.70, ph $16.80 PB 134 926

Nearly 1000 bottom samples from the shallow portions of the East and South China Seas were studied and compared with sources and oceanographic conditions.

Washington U., Seattle.
CONFERENCE ON RAPID DATA-HANDLING IN OCEANOGRAPHY, HELD AT LAKE WILDERNESS LODGE, MAPLE VALLEY, WASH., 14-16 Nov 56, by Robert G. Paquette. May 57, 50p. Contract Nonr-477(01); Technical rept. no. 52; Ref. 57-11.
Order from LC mi $3.30, ph $7.80 PB 134 457

The Conference on Rapid Data-Handling in Oceanography met to determine if high-speed data-processing methods could reduce the backlog of unreported and unanalyzed data and ease the burden of data-processing for institutions collecting routine oceanographic data. It was recommmended that oceanographic institutions start to use electronic data-processing.

Physics of the Atmosphere

Aeronutronic Systems, Inc., Glendale, Calif.
MODELS FOR SPECTRAL BAND ABSORPTION, by Gilbert N. Plass. Apr 58, 48p. Contract AF 19 (604)2166. ASI pub. no. U-176; AFCRC TN 58-267; AD-152 513.
Order from LC mi $3.30, ph $7.80 PB 134 958

An exhaustive, theoretical study is made of the various models that have been proposed to represent band absorption. These models are compared with each other; a derivation is given of the regions where they predict the same absorption. The regions of validity for various useful approximatio to these models are also given. The statistical model is extended to include the random superposition of a finite number of Elsasser bands. Thus a continuous spectrum of absorption curves is obtained between the results for the Elsasser and the pure statistical models. The absorption predicted by the statistical model when there is a specific number of spectral lines in the frequency interval under consideration is compared with the limit as the number of lines approaches infinity.

Kyoto U. (Japan)
ELECTRIFICATION OF MINOR SHOWERCLOUDS: SYSTEMATIC DETAILED INVESTIGATIONS OF THE ELECTRIFICATION IN MINOR SHOWER-CLOUDS WHICH APPEAR IN THE COLD SEASON AND HAVE A DIMENSION OF THE ORDER OF 2-3km, by Yuichi Tamura. Final rept. June 56. 64p. Contract AF 62(502)1219; AFCRC TR 56-296; AD- 98 755.
Order from LC mi $3.90, $10.80 PB 133 22

Investigations were made on the electrification of minor showerclouds which frequently appear in Japan during the cold season. Ten cases of electrification of showerclouds were studied by analyzing the electric fields caused by them. Some statistical studies were also made. The results of studies are summarized.

Massachusetts Inst. of Tech., Cambridge.
MEASUREMENT OF DROP SIZE DISTRIBUTION AND LIQUID WATER CONTENT IN NATURAL CLOUDS. Final rept. 1 Oct 54-31 Dec 57. Jan 58, 15p. Contract AF 19(604)1287; AFCRC TR 58-231.
Order from LC mi $2.40, ph $3.30 PB 134 377

An airborne probe-type instrument for counting and sizing cloud drops has been extensively redesigned and field tested on a mountain top and in an aircraft. It has proved capable of counting water droplets in the size range of approximately one- to sixty-microns diameter.

ENGINEERING

Aeronautical Engineering

Advisory Group for Aeronautical Research and Development, Paris, France.
AIRCRAFT STRUCTURAL FACTOR OF SAFETY, by George N. Mangurian. Nov 57, 32p.
Order as AGARD report 154 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

Presented at the Sixth Meeting of the Structures and Materials Panel, held from Nov 4-8, 1957, Paris, France.

Presents the case for a review of the Aircraft Structural Factor of Safety in the light of appreciable advancements in structural and aerodynamic knowledge. In certain design aspects, a reduction in the presently required ultimate factor of safety is realistic and should be considered; in other aspects, a reduction should not be considered at present.

Advisory Group for Aeronautical Research and Development, Paris, France.
INORGANIC TRANSPARENCIES FOR AIRCRAFT ENCLOSURES, by C.H. Hahner and M.J. Kerper. Nov 57, 28p. 24 refs.
Order as AGARD Report 161 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

Presented at the Sixth Meeting of the Structures and Materials Panel, held from Nov 4-8, 1957, Paris, France.

Present and projected designs of aircraft impose very severe requirements on the transparent materials used in construction. Aerodynamic heating results in temperatures above those at which present day plastic materials can be used. Glass is the best glaxing material available but complete information on its properties under the contempleted conditions of use are not yet available. This Report is a review of the available information on glass and contains a description of work now being done under the sponsorship of the Wright Air Development Center to obtain additional information on a few selected glasses that are believed to be most suitable for use in aircraft. The glasses selected for study are ones that can be made in the form of polished plate glass of the required sizes.

Advisory Group for Aeronautical Research and Development, Paris, France.
RÉFLEXIONS GÉNÉRALES SUR LA SECURITÉ DES MATÉRIAUX ET DES STRUCTURES (GENERAL NOTES ON SAFETY OF MATERIALS AND STRUCTURES), by E. Marcel Prot. Nov 57, 16p.
Order as AGARD Report 151 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

Communication presentée à la 6e session du groupe de travail Structures et Matériaux de l'AGARD, Paris, France, 4-8 Novembre, 1957.

Advisory Group for Aeronautical Research and Development, Paris, France.
TRANSPARENT MATERIALS FOR AIRCRAFT - A REVIEW, by E.W. Russell. Nov 57, 18p.
Order as AGARD Report 160 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

Presented at the Sixth Meeting of the Structures and Materials Panel, held from 4-8, Nov 1957, Paris, France.

Developments in transparent materials for aircraft are reviewed. Extensive work has been done on the organic plastics, and offers improved performance and reliability, but with only limited advances in high temperature performance. As alternative materials the inorganic glasses compel attention and are shown to suffer from several limitations both for windscreens and canopies. Possible lines of development are briefly indicated.

Heat Transfer Lab., Illinois Inst. of Tech., Chicago.
AIRCRAFT WINDSHIELD HEAT AND MASS TRANSFER. PART 1, by Max Jakob, Stothe P. Kezios and others. Apr 55, 81p. Contract W535-ac-40628 (10620); AF TR 6120, pt. 1; AD-93 866.
Order from LC mi $4.80, ph $13.80 PB 130 810

The investigation secured data of the mean heat transfer coefficient in impact by laboratory experiments and showed how to use the data in the theoretical calculation of heat transfer, ice formation, and ice removal by sublimation or melting under flying conditions. The mean impact heat transfer coefficient was measured by means of flat plate steam calorimeters of various diameters mounted in a large wooden flat plate -- all located perpendicular to the air stream of an open throat wind tunnel. The coefficients were correlated to the measured velocities of the arriving air and the air flowing parallel to the calorimeter surface. (See also PB 130 811, 130 398, 130 938, 130 820)

Heat Transfer Lab., Illinois Inst. of Tech., Chicago.
AIRCRAFT WINDSHIELD HEAT AND MASS TRANSFER. PART 2, by Max Jakob, Robert L. Rose, and Maurice Spielman. Apr 47, 126p. Contract W33-038-ac-10349; AF TR 6120, pt. 2; AD-202 773.
Order from LC mi $6.30, ph $19.80 PB 130 811

The investigation deals with the heat transfer and entrainment of water vapor phenomena for the case of hot air jet discharging on the inside surface of transparent areas of aircraft. The experimental investigation simulated an aircraft windshield by an instrumented flat plate with a hot air jet whose humidity could be varied flowing over one surface and the other surface cooled by flowing water. Graphs of plate temperature, jet temperature, jet velocity, and humidity patterns are given. Measured temperatures and partial pressures are correlated in dimensionless form to the local heat transfer coefficient, distance from the nozzle, and properties of the air. Coefficients of mass transfer are calculated using the theory of similarity. A simple method is given for predicting the start of condensation of freezing at the inside surface of a windshield. A special dew-point meter was developed. (See also PB 130 810, 130 398, 130 938, 130 820)

Heat Transfer Lab., Illinois Inst. of Tech., Chicago.
AIRCRAFT WINDSHIELD HEAT AND MASS TRANS-

FER. PART 3, by Max Jakob, Stothe P. Kezios and others. Jul 49, 358p. Contract W33-038-ac-16808 (17515); AF TR 6120, pt. 3; AD-93 865.
Order from LC mi $11.10, ph $54.60 PB 130 398

Experimental studies showed the mean heat transfer coefficient of impact, measured by the use of a steam plate calorimeter in a jet of air, to range between 3.6 and 14.9 BTU hr^{-1} ft^{-2} F^{-1}. A multiple-plate mass-flow meter, simulating the wetted inner surface of an aircraft windshield, was operated under isothermal and nonisothermal conditions to obtain local mass transfer coefficients. A dimensionless correlation of mass transfer data is given. Experiments on mass transfer by forced convection in air were performed on napthalene and para-dichlorobenzene disks. An analogy between heat and mass transfer of naphthalene is shown to exist. The Colburn j-factor was used to correlate the results. Heat transfer experiments were performed on a plate simulating a windshield being defrosted by a hot air jet. Graphs of jet velocity, jet temperature, and heat transfer coefficients are given. (See also PB 130 810, 130 811, 130 820, 130 938)

Heat Transfer Lab., Illinois Inst. of Tech., Chicago.
AIRCRAFT WINDSHIELD HEAT AND MASS TRANSFER. PART 4, by Max Jakob, Stothe P. Kezios, and others. Apr 50, 101p. Contract W33-038-ac-16808(17515); AF TR 6120, pt. 4; AD-102 049.
Order from LC mi $5.70, ph $16.80 PB 130 938

Experiments on mean impact heat transfer coefficients were made. Data correlated with exponent 0.5 on the Reynolds Number. Results of impact mass transfer on para-dichlorobenzene disks were corrected using recently available vapor-pressure data. Experiments on mass transfer by force convection were made with naphthalene cylinders in parallel air flow. In the turbulent range the modified Nusselt Numbers varied with 0.8th power of Reynolds Number and were higher than corresponding Nusselt Numbers of heat transfer. A curved plate heat-flow meter was tested and a high exponent of Reynolds Number was obtained. (See also PB 130 810, 130 811, 130 398, 130 820)

Heat Transfer Lab., Illinois Inst. of Tech., Chicago.
AIRCRAFT WINDSHIELD HEAT AND MASS TRANSFER. PART 5, by Max Jakob, Stothe P. Kezios and others. June 52, 451p. Contract AF 33(038)15941; AF TR 6120, pt. 5; AD-12 161.
Order from LC mi $11.10, ph $69.60 PB 130 820

Design information is presented for the heating, defrosting, and defogging of the interior surface of aircraft windshields. The design information is assembled from laboratory experiments, performed on models of aircraft windshields, cylinders, and flat plates. Heat transfer data correlations are presented for the simulated interior surfaces of windshields heated by hot air jets. Local coefficients of mass and heat transfer are given for the case of a jet of air flowing over a flat windshield having a continuously wetted surface. Results of sublimation experiments performed on hemispherically capped, right circular cylinders and related heat transfer experiments of the literature are compared with a developed theory correlating mean coefficients of heat and mass transfer. An experimental investigation of the vapor pressure and diffusion coefficients of the materials used in the sublimation was performed and the results given. (See also PB 130 810, 139 811, 130 398, 130 938)

National Advisory Committee for Aeronautics, Washington, D.C.
ANALYTICAL RELATION FOR WAKE MOMENTUM THICKNESS AND DIFFUSION RATIO FOR LOW-SPEED COMPRESSOR CASCADE BLADES, by Seymour Lieblein. Aug 58, 31p.
Order as TN 4313 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

Presents derivation of simple equation for blade-wake momentum thickness as function of suction-surface diffusion ratio that describes previously reported experimental correlation. Equation is based on boundary-layer theory in conjunction with simplifying approximations and empirical constants. Calculations are made from derived equation to indicate the comparative effects on the limiting diffusion ratio of blade-chord Reynolds number, surface roughness, and location of transition. Results are utilized for discussions of experimental correlations and general blade design considerations.

National Advisory Committee for Aeronautics, Washington, D.C.
COMPARISON OF TWO METHODS FOR CALCULATING TRANSIENT TEMPERATURES FOR THICK WALLS, by James J. Buglia and Helen Brinkworth. Aug 58, 19p.
Order as TN 4343 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

A comparison is made of two different methods of calculating transient temperatures for thick walls with arbitrary variation of heat-transfer coefficient and adiabatic-wall temperature. Numerical calculations for special cases for which the exact solutions are available show that both methods give accurate results. Hill's method (NACA Technical Note 4105) is shown to be generally superior to Dusinberre's method (Trans. A.S.M.E., vol. 67, no. 8) in both speed and accuracy, if a table of memory coefficients is available.

National Advisory Committee for Aeronautics, Washington, D.C.
EFFECTIVENESS OF BOUNDARY-LAYER CONTROL, OBTAINED BY BLOWING OVER A PLAIN REAR FLAP IN COMBINATION WITH A FORWARD SLOTTED FLAP, IN DEFLECTING A SLIPSTREAM

DOWNWARD FOR VERTICAL TAKE-OFF, by Kenneth P. Spreemann. Feb 58, 32p.
Order as TN 4200 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

The wing employed in this investigation had a 67-percent-chord slotted flap in combination with a 33-percent-chord plain rear flap equipped with a full-span blowing nozzle. The tests were conducted in a static-thrust facility at the Langley Aeronautical Laboratory. The investigation indicated that the plain rear flap alone with a low momentum coefficient for boundary-layer control provided larger turning angles than the combined slotted and plain flaps without boundary-layer control.

National Advisory Committee for Aeronautics, Washington, D.C.
EVALUATION OF EFFECTS OF FLEXIBILITY ON WING STRAINS IN ROUGH AIR FOR A LARGE SWEPT-WING AIRPLANE BY MEANS OF EXPERIMENTALLY DETERMINED FREQUENCY-RESPONSE FUNCTIONS WITH AN ASSESSMENT OF RANDOM-PROCESS TECHNIQUES EMPLOYED, by Thomas L. Coleman, Harry Press, and May T. Meadows. July 58, 76p.
Order as TN 4291 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

Flight test measurements on a large swept-wing bomber airplane through rough air at altitudes of 5,000 and 35,000 feet are analyzed in order to determine the effects of airplane flexibility on wing bending and shear strains. For this purpose, the power spectra of the strain responses and the frequency-response functions for the strain responses to vertical gust disturbances are determined and compared with the strain responses for a quasi-rigid airplane. The measured power spectra and frequency-response functions are subject to distortion and statistical sampling errors from a variety of sources. A general analysis of the reliability of such results is presented and methods of estimating the distortions and sampling errors are developed. These methods are applied to the interpretation of the test results.

National Advisory Committee for Aeronautics, Washington, D.C.
GENERAL INSTABILITY OF STIFFENED CYLINDERS, by Herbert Becker. July 58, 26p.
Order as TN 4237 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

Theoretical buckling stresses are determined in explicit form for circular cylinders with circumferential and axial stiffening. The loadings are axial compression, radial pressure, hydrostatic pressure, and torsion. Analyses were confined to moderate length and long cylinders. Derivation of form of Donnell s equation applicable to orthotropic cylinders is presented in this report.

National Advisory Committee for Aeronautics, Washington, D.C.
ICING FREQUENCIES EXPERIENCED DURING CLIMB AND DESCENT BY FIGHTER-INTERCEPTOR AIRCRAFT, by Porter J. Perkins. July 58, 30p.
Order as TN 4314 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

National Advisory Committee for Aeronautics, Washington, D.C.
INVESTIGATION OF SEMIVANELESS TURBINE STATOR DESIGNED TO PRODUCE AXIALLY SYMMETRICAL FREE-VORTEX FLOW, by Harold E. Rohlik and William T. Wintucky. Apr 57, 39p.
Order as TN 3980 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

A semivaneless turbine stator designed to eliminate blade wakes and secondary-flow accumulations of boundary-layer air was built and tested. Performance of this stator was evaluated with static pressures measured in the vaneless section and surveys of total pressure and flow angle made at the stator exit. Results are presented in terms of theoretical and experimental velocities and flow angles, boundary-layer parameters, and contours of total pressure loss across the stator.

National Advisory Committee for Aeronautics, Washington, D.C.
LIFT AND MOMENT ON THIN ARROWHEAD WINGS WITH SUPERSONIC EDGES OSCILLATING IN SYMMETRIC FLAPPING AND ROLL AND APPLICATION TO THE FLUTTER OF AN ALL-MOVABLE CONTROL SURFACE, by H.J. Cunningham. Jan 58, 58p.
Order as TN 4189 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

A method based on linearized supersonic potential-flow theory, applied previously to vertical translation and pitching oscillations, is applied herein to symmetric flapping and rolling oscillations to obtain section and total unsteady lift and moment coefficients. Spanwise distributions are illustrated and compared with results of a strip-theory method. The aerodynamic coefficients are applied to a coupled-mode flutter analysis of an all-movable control surface for which the flexibilities are concentrated in a supporting shaft.

National Advisory Committee for Aeronautics, Washington, D.C.
LOCAL INSTABILITY OF THE ELEMENTS OF A TRUSS-CORE SANDWICH PLATE, by Melvin S. Anderson. July 58, 21p.
Order as TN 4292 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

The charts presented give the compressive buckling

coefficients for a single-truss-core and a double-truss-core sandwich plate. These charts cover a wide range of sandwich proportions and may be used for sandwiches with unequal faces. They apply to inplane compressive loads acting parallel or perpendicular to the core direction or for various combinations of these loads.

National Advisory Committee for Aeronautics, Washington, D.C.
METHOD OF SPLIT RIGIDITIES AND ITS APPLICATION TO VARIOUS BUCKLING PROBLEMS, by P.P. Bijlaard. July 58, 97p.
Order as TN 4085 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

A comprehensive treatise on the method of split rigidities is presented. The method is applied to a number of buckling problems. The accuracy of the method is shown by comparing the results of the method with the results of exact solutions.

National Advisory Committee for Aeronautics, Washington D.C.
SUBSONIC FLIGHT INVESTIGATION OF METHODS TO IMPROVE THE DAMPING OF LATERAL OSCILLATIONS BY MEANS OF A VISCOUS DAMPER IN THE RUDDER SYSTEM IN CONJUNCTION WITH ADJUSTED HINGE-MOMENT PARAMETERS, by Harold L. Crane, George J. Hurt, Jr. and John M. Elliott. Jan 58, 45p.
Order as TN 4193 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

A single-degree-of-freedom analysis used as a guide to adjust the parameters is presented. A brief discussion of related problems which may result from the application of such a viscous damping device is given. The results of rudder trailing-edge strips to control rudder floating tendency are presented.

National Advisory Committee for Aeronautics, Washington, D.C.
SUMMARY OF GROUND-LOADS STATISTICS, by John R. Westfall, Benjamin Milwitzky, and others. May 57, 15p.
Order as TN 4008 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

This paper briefly summarizes the more important statictical data obtained by the NACA on the subject of ground loads. The information presented relates primarily to landing-impact and taxiing loads; however, some limited data are also presented on one phase of ground-handling loads, namely, braking friction. A number of experimental and theoretical papers dealing with various aspects of the subject are listed in the bibliography.

National Advisory Committee for Aeronautics, Washington, D.C.
SUMMARY OF METHODS OF MEASURING ANGLE OF ATTACK ON AIRCRAFT, by William Gracey. Aug 58, 29p.
Order as TN 4351 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

Wind-tunnel calibrations of three types of angle-of-attack sensing devices - the pivoted vane, the differential pressure tube, and the null-seeking pressure tube - are presented. Flight data on the position errors of three sensor locations - ahead of the fuselage nose, ahead of the wing tip, and on the forebody of the fuselage - are also presented. Various methods for calibrating angle-of-attack installations in flight are briefly described.

Technical Development and Evaluation Center, Indianapolis, Ind.
EVALUATION OF BLACK RUBBER-PLASTIC STRIP HOLDERS FOR FLIGHT PROGRESS BOARDS, by Russell M. Andrew and Fred S. McKnight. Aug 58, 7p. TDR 285.
Order from OTS 50 cents PB 151 060

Bell Telephone Laboratories, in analyzing noise at ARTC centers, recommended the use of some material other than metal for strip holders. Black and gray rubber-plastic strip holders were tested at Indianapolis. This report covers the tests of the black holders.

Technical Development and Evaluation Center, Indianapolis, Ind.
INVESTIGATION OF SOME MEANS TO IMPROVE THE DAYTIME CONSPICUITY OF AIRCRAFT, by Wayne D. Howell. July 58, 17p. TDR 344.
Order from OTS 50 cents PB 151 234

This report covers the results obtained from a preliminary investigation of the use of experimental solar reflectors, sweep-beam high-intensity lights, and fluorescent paint as possible means for improving the daytime conspicuity of aircraft.

Wichita U., Kans.
CIRCULATION CONTROL RESEARCH WIND-TUNNEL TESTS OF A POWERED, BLOWING-TYPE, CIRCULATION CONTROL RESEARCH AIRPLANE MODEL. PART 1. INVESTIGATION OF THE BASIC AERODYNAMIC CHARACTERISTICS OF A CIRCULATION CONTROL RESEARCH MODEL, by J.L. Statler. Dec 56, 43p. Contract Nonr-201(01); Engineering rept. no. 187-1.
Order from LC mi $3.30, ph $7.80 PB 134 287

(See also PB 134 288, 134 319-134 322)

Wichita U., Kans.
CIRCULATION CONTROL RESEARCH WIND-TUNNEL TESTS OF A POWERED, BLOWING-TYPE,

CIRCULATION CONTROL RESEARCH AIRPLANE MODEL. PART 2. EFFECTS OF POWER ON THE AERODYNAMIC CHARACTERISTICS OF A CIRCULATION CONTROL RESEARCH MODEL, by J. L. Stalter and Robert K. Wattson, Jr. Mar 57, 63p. Contract Nonr-201(01). Engineering rept. no. 187-2.
Order from LC mi $3.90, ph $10.80 PB 134 288

(See also PB 134 287, 134 319-134 322)

Wichita U., Kans.
CIRCULATION CONTROL RESEARCH WIND-TUNNEL TESTS OF A POWERED, BLOWING-TYPE, CIRCULATION CONTROL RESEARCH AIRPLANE MODEL. PART 3. EFFECTS OF A BLOWING-TYPE CIRCULATION CONTROL SURFACE CHARACTERISTICS, by J. L. Stalter. May 57, 51p. Contract Nonr-201(01); Engineering rept. no. 187-3.
Order from LC mi $3.60, ph $9.30 PB 134 319

(See also PB 134 287, 134 288, 134 320-134 322)

Wichita U., Kans.
CIRCULATION CONTROL RESEARCH WIND-TUNNEL TESTS OF A POWERED, BLOWING-TYPE, CIRCULATION CONTROL RESEARCH AIRPLANE MODEL. PART 4. EFFECTS OF WING CIRCULATION CONTROL AND POWER ON FLOW CHARACTERISTICS IN THE REGION OF THE TAIL SURFACES, by J. L. Stalter. Apr 57, 55p. Contract Nonr-201(01); Engineering rept. no. 187-4.
Order from LC mi $3.60, ph $9.30 PB 134 320

(See also PB 134 287, 134 288, 134 319, 134 321, 134 322)

Wichita U., Kans.
CIRCULATION CONTROL RESEARCH WIND-TUNNEL TESTS OF A POWERED, BLOWING-TYPE, CIRCULATION CONTROL RESEARCH AIRPLANE MODEL. PART 5. FLOW VISUALIZATION STUDIES WITH POWER AND WING CIRCULATION CONTROL, by J. L. Stalter and Robert K. Wattson, Jr. Feb 57, 68p. Contract Nonr-201(01); Engineering rept. no. 187-5.
Order from LC mi $3.90, ph $10.80 PB 134 321
(See also PB 134 287, 134 288, 134 319, 134 320, 134 322)

Wichita U., Kans.
CIRCULATION CONTROL RESEARCH WIND-TUNNEL TESTS OF A POWERED, BLOWING-TYPE, CIRCULATION CONTROL RESEARCH AIRPLANE MODEL. PART 6. SUMMARY REPORT, by Robert K. Wattson, Jr. Feb 58, 81p. Contract Nonr-201(01); Engineering rept. no. 187-6; AD-156 343.
Order from LC mi $4.80, ph $13.80 PB 134 322

The effects of circulation control on the contribution of thrust to wing lift and drag, and on the effectiveness of the movable control surfaces, were obtained. The behavior of the flow field about the model was protrayed using surface tufts, a tuft grid, and a multi-tube survey rake for ascertaining downwash velocities and angles at the tail location. A brief interpretive analysis, applied to hypothetical airplanes of fixed size and varying wing and power loadings, is presented. (See also PB 134 287, 134 288, 134 319-134 321)

Chemical Engineering

SYMPOSIUM ON RESPIRATORY PROTECTIVE DEVICES AND CIVIL DEFENSE, 1955. Papers presented at Cincinnati, Ohio, 4 Apr 55. 201p.
Order from LC mi $9.30, ph $13.80 PB 132 355

Sponsored by Division of Industrial Chemistry, American Chemical Society. Saul Hormats, Chairman.

Contents: Introductory remarks, by S. Hormats. - The mechanical filtration of aerosols, by W. L. Anderson and E. A. Ramskill. - Formation of filter materials from glass fibers, by Van A. Wente and R. T. Lucas. - Design considerations in the development of protective masks, by Bernard Siegel and Frank Shanty. - Laboratory evaluation of protective masks, by Bernard Siegel, Frank Shanty, and Charles J. Shoemaker. - Efficiency of individual and collective protective equipment against radioactive materials, by E. H. Engquist, J. R. Hendrickson, and J. W. Thomas. - Methods used in the evaluation of gas masks and aerosol filters for particulate aerosol penetration, by Frederick Lense and H. Gerald Guyton. - The diffusional concept of toxic agent protection, by L. A. Jones, B. L. Karpel. - Investigation of wet scrubbing methods for chemical agent removal, by J. R. Conlisk and John C. Boardway. - The role of the chemist in civil defense, by Charles W. Steele, A. B. Andrews, John L. Parsons, and Walter A. Lawrence. - Public health service civil defense reaearch program, by Bernard Berger and H. F. Ludwig.

Army Chemical Warfare Labs., Army Chemical Center, Md.
DEVELOPMENT OF DECONTAMINANT SOLUTIONS, DG (AIR FORCE NONCORROSIVE DECONTAMINANT FOR G AGENTS), by J. B. Jackson. Sep 57, 22p. CWLR 2175.
Order from LC mi $2.70, ph $4.80 PB 132 962

Report covers the development of G-agent decontaminating solutions, based on Air Force cleaning compounds, which are noncorrosive to the common metals and usable under all climatic conditions.

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
FACTORS WHICH INFLUENCE THE SUITABILITY OF LIQUID PROPELLANTS AS ROCKET MOTOR REGENERATIVE COOLANTS, by D. R. Bartz.

Dec 56, 24p. Contract DA 04-495-ORD-18; Memo. no. 20-139, AD-133 919.
Order from LC mi $2.70, ph $4.80 PB 133 818

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PRELIMINARY INVESTIGATION OF THE ATOMIZATION OF LIQUIDS INJECTED INTO AN AIR STREAM, by Jacob M. Schmidt. May 49, 23p. Contracts W535-ac-20260, W33-038-ac-4320, and W04-200-ORD 455; Rept. no. 4-101.
Order from LC mi $2.70, ph $4.80 PB 134 407

Civil Engineering

National Advisory Committee for Aeronautics, Washington, D.C.
MEASUREMENTS AND POWER SPECTRA OF RUNWAY ROUGHNESS AT AIRPORTS IN COUNTRIES OF THE NORTH ATLANTIC TREATY ORGANIZATION, by Wilbur E. Thompson. July 58, 85p.
Order as TN 4303 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

National Advisory Committee for Aeronautics, Washington, D.C.
VARIATIONAL THEOREM FOR CREEP WITH APPLICATIONS TO PLATES AND COLUMNS, by J. Lyell Sanders, Jr., Harvey G. McComb, Jr. and Floyd R. Schlechte. May 57, 23p.
Order as TN 4003 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

A variational theorem is presented for a body undergoing creep. Solutions to problems of creep bending and creep collapse of plates, columns, beams, and shells can be obtained by means of the direct methods of the calculus of variations in conjunction with the stated theorem. The application of the theorem is illustrated for plates and columns by the solution of two sample problems.

Naval Civil Engineering Research and Evaluation Lab., Port Hueneme, Calif.
PROTECTIVE COATING FOR STEEL PILING: RESULTS OF 6-MONTH TESTS, by R.L. Alumbaugh, C.V. Brouillette, and A.L. Fowler. Sep 57, 35p. Technical note no. 309.
Order from LC mi $3.00, ph $6.30 PB 135 133

A Saran resin coating gave almost complete protection during the 6-month exposure period, and seven other coating systems appeared to provide adequate protection in all exposure zones - (atmospheric, tidal, mudline, and underground areas.)

Naval Civil Engineering Research and Evaluation Lab., Port Hueneme, Calif.
TESTS OF CONCRETE DEADMAN ANCHORAGES IN SAND, by J.E. Smith. Feb 57, 51p. Technical memo. no. M-121.
Order from LC mi $3.60, ph $9.30 PB 134 997

Prototype scale deadman anchorage tests were conducted to obtain information on the holding powers and the associated movements of deadmen. This report concerns the sand phase of testing in which horizontal loads were applied to concrete deadmen buried at various depths down to 3 feet.

Southwest Research Inst., San Antonio, Tex.
RESEARCH STUDIES OF METHODS FOR INCREASING SOIL TRAFFICABILITY, by Andrew G. Pickett and M.M. Lemcoe. Final rept. Dec 57, 76p. 264 refs. Contract AF 19(604)2217; AFCRC TR 58-210; AD-146 849.
Order from LC mi $4.50, ph $12.30 PB 135 287

A basic study was made of clay top soils in order to devise methods for controlling the parameters which affect the shear strength of such soils. Information was assembled from the diverse fields of mineralogy chemistry, physics, bacteriology, and engineering mechanics in an attempt to synthesize a theory of clay soils which would identify the significant parameters and indicate possible control measures. Pilot laboratory investigations were made of conflicting hypotheses and of suggested methods of conducting the study. No simple mechanism or single theory was found which explained the physical properties of clay soils. Some pertinent conclusions are that (1) water film strength is of little significance in clay soils, (2) only the interlayer water of montmorillonite at very low moisture content has viscosity approaching that of Ice I, (3) the high energy sites at which water is bound to dry clay can be better used to attach a cementing agent, and (4) waterproofing the clay surface does not destroy natural cohesive strength which was postulated to result from water film strength. RF spectroscopy is considered a useful new analytical tool for application to soils engineering.

Electrical and Electronic Engineering

Air Force Cambridge Research Center, Bedford, Mass.
MULTIDIMENSIONAL ENVELOPE AND POWER DISTRIBUTIONS WITH EXPONENTIAL CORRELATION; APPLICATIONS TO DIVERSITY, by John N. Pierce. Mar 58, 32p. AFCRC TR 58-121; AD-146 893.
Order from LC mi $3.00, ph $6.30 PB 134 491

A special form of correlation matrix is assumed for nonindependent samples from a narrow-band noise-like process. The joint probability density function for instantaneous power and envelope is found by using this special form. The result is applicable to the output of narrow-band filters and to diversity systems operating on scatter paths and in multipath situations.

Air Force Inst. of Tech., Dayton, Ohio.
ANALYSIS AND APPLICATIONS OF A VARIABLE CAPACITANCE JUNCTION DIODE, by Lawrence Roesler. Thesis, Mar 58, 36p.
Order from LC mi $3.90, ph $10.80 PB 134 835

This paper is the result of an attempt to explore the possible uses for the capacitance found in P-N junctions, and to analyse the various parameters which might be controllable in the design and manufacture of these junctions. The circuits used in obtaining data are but one of many possible arrangements for which the capacitance of the junction can be used.

Air Force Inst. of Tech., Dayton, Ohio.
APPLICATION OF SURFACE-WAVE THEORY TO MEASUREMENTS IN THE SURFACE-WAVE DIELECTROMETER, by G.E. Weinstein. Thesis, Mar 58, 82p. GE 58-16.
Order from LC mi $4.80, ph $13.80 PB 134 834

This paper is a result of a library and laboratory research program concerning the theory of surface-waves in an attempt to apply this theory to the extraction of dielectric constant and loss tangent from the surface-wave dielectrometer.

Air Force Inst. of Tech., Dayton, Ohio.
ELECTRON ENERGY DISTRIBUTION IN A MERCURY GAS DISCHARGE, by Charles Waters Bryan. Thesis Mar 58, 47p. GE 58-4.
Order from LC mi $3.30, ph $7.80 PB 134 838

Air Force Inst. of Tech., Dayton, Ohio.
LOPROTRON, A NEW BEAM SWITCHING TUBE, by Charles R. Prohaska. Thesis, Mar 58, 46p. GE 58-9.
Order from LC mi $3.30, ph $7.80 PB 134 692

Increased requirements for reductions in the size and complexity of digital machinery prompted an investigation into the design of a component to perform directly the operation of decoding. Theoretical and machine solutions were made for a proposed method of switching by the action of longitudinal magnetic fields on an electron beam. Laboratory experiments were performed to determine the feasibility of the principle of operation indicated by theory. Construction details for a prototype component, the Loprotron, are given. Possible applications discussed include full binary addition, analogue-to-digital conversion, and digital-to-analogue conversion. Limitations and requirements affecting the future of the Loprotron are discussed.

Army Signal Engineering Labs., Fort Monmouth, N.J.
LEAKAGE-FREE MAGNET FOR SMALL MAGNETRONS, by Gerald Klein. Jan 58, 13p. Technical memo. M-1947.
Order from LC mi $2.40, ph $3.30 PB 135 101

This report describes a magnet configuration which is suitable for application to small beacon magnetrons. The magnets presently employed for miniature magnetrons exhibit leakage flux which can interfere with nearby equipment and render the tube susceptible to demagnetization. It is shown that it is possible to design an efficient cylindrical magnet for miniature magnetrons which has no external leakage flux and which is not subject to these deficiencies.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
EFFECT OF INSUFFICIENT LOAD ISOLATION ON A MICROWAVE INTERFEROMETER, by Webster M. Kendrick and James E. Anders. Oct 56, 16p. Rept. no. 998.
Order from LC mi $2.40, ph $3.30 PB 134 282

The output waveform of a microwave interferometer can be seriously distorted by fluctuations in the klystron power output caused by a variable load. Some experimental results showing the effect of insufficient load isolation are given. Two methods of improving the load isolation are discussed.

Battelle Memorial Inst., Columbus, Ohio.
COMPONENT EVALUATION AND SPECIFICATION ENGINEERING, by C.A. Shearer, E.N. Wyler and others. Final report on Task 34, Carbon-Composition Resistor Failure Rates. Oct 57, 51p. Contract DA 36-039-sc-63136.
Order from LC mi $3.60, ph $9.30 PB 133 883

The major part of the program was a study of the failure-rate characteristics of carbon-compositions resistors during an extended operational load life of 10,000 hours. In addition, other environmental conditions were studied in an attempt to establish a failure pattern for this type of resistor. The resistors used in the program were obtained from three manufacturers in order to represent a major cross section of the present production capacity.

Columbia U., New York.
EFFECT OF QUANTIZATION IN SAMPLED-FEEDBACK SYSTEMS, by John E. Bertram. Nov 57, 22p. Contract AF 18(600)677; AFOSR TN 57-775; CU 38-57-AF-677; AD 148 005.
Order from LC mi $2.70, ph $4.80 PB 133 341

The rapid advance of digital computers and digital technology has in recent years resulted in the development of digital versions of practically every control system component. As a result mixed systems composed of both digital and analog elements are becoming quite common. This paper concerns the effect of quantization or round-off errors, inherent in the digital elements, on the performance of feedback control systems.

Diamond Ordnance Fuze Labs., Washington, D.C.
PERFORMANCE OF TRANSISTORS IN VIDEO AMPLIFIERS, by T.A. Prugh. Jan 57, 36p. Rept. no. TR-418; AD-131 911.
Order from LC mi $3.00, ph $6.30 PB 133 817

Detailed theoretical data are presented on the performance of 2N139, TA-E 1579, SB-100, and 2N104 transistors in video amplifiers. The results were obtained without approximations by use of the National Bureau of Standards SEAC computer. A simplified calculation of the performance is shown to give satisfactory accuracy for most applications. Experimental data were also taken on actual amplifiers which confirms the validity of the theoretical work. Inductance compensation was incorporated into the SEAC program and also checked experimentally. The gain-bandwidth is increased by a factor of 1.82 over the uncompensated value. Included is a compilation of constants which are of importance in video amplifier applications and information on the dependence of those constants upon the transistor parameters, such as alpha cutoff frequency, base lead resistance, and collector capacity.

Diamond Ordnance Fuze Labs., Washington, D.C.
TRANSISTOR ADMITTANCE MEASUREMENTS IN THE 0.1 TO 5MC RANGE USING THE TYPE B-601 WAYNE-KERR R.F. BRIDGE, by G.N. Kambouris. May 58, 23p. TR-582.
Order from LC mi $2.70, ph $4.80 PB 134 634

This report covers the modifications of the Wayne-Kerr R.F. Admittance Bridge Type B-601, the test used, and precautions found necessary to measure transistor short-circuit admittance parameters. Measurements were made of several transistor types for their complex admittance parameters over the frequency range of 100 kc/s to 5 Mc/s.

Diamond Ordnance Fuze Labs., Washington, D.C.
ZINC-SILVER OXIDE CELL LOW TEMPERATURE OPERATION WITHOUT AUXILIARY HEATING, by I.A. Denison, W.J. Pauli, and G.R. Snyder. Dec 57, 22p. Technical rept. no. 560.
Order from OTS 75 cents PB 131 787

Zinc-silver oxide-alkali batteries are notable for their high output of electrical energy per unit of volume and weight, but the efficiency of existing types is reduced considerably when discharged at low temperatures. The practical problem of discharging the zinc-silver oxide battery at low temperatures has been met by removing the oxide film on commercially available zinc negatives by various chemical treatments rather than by following the usual procedure of raising the ambient temperature by auxiliary heating devices. As the result of the improved performance from the described treatments, a new approach is feasible for the development of silver oxide-zinc batteries for military use over the temperature range from -65°F to 160°F.

U. of Illinois, Electrical Engineering Research Lab., Urbana.
EVALUATION OF ELECTRICAL EARTH CONSTANTS, by Spencer Leifheit. June 57, 48p. Contract Nonr-1834(02); Technical rept. no. 7.
Order from LC mi $3.30, ph $7.80 PB 134 344

Suitable methods for the evaluation of electrical earth constants are reviewed and a general method for determining depth of burial for cables entering a high frequency radio direction finding site is presented. Results of calculations of the depth of signal penetration in soil over various ranges of the conductivity, dielectric constant, and frequency are given. A detailed bibliography of existing literature on the evaluation of earth constants is also included.

U. of Illinois, Electrical Engineering Research Lab., Urbana.
VERY WIDE BAND BALUN TRANSFORMER FOR VHF AND UHF, by T.R. O'Meara and R.L. Sydnor. July 57, 55p. Contract Nonr-1834(02); Technical rept. no. 9.
Order from LC mi $3.60, ph $9.30 PB 134 655

A transformer is described which may be used as a phase inverter, a differential transformer, or as a balun transformer. Practical models have been built which operate over nearly three decades of frequency with hand widths approaching one kilomegacycle.

Electronic Defense Lab., Mountain View, Calif.
IMPROVED 2- TO 4-KMC BAND-PASS STRIPLINE FILTER, by Everett E. Guthrie. Apr 57, 9p. Contract DA 36-039-sc-71053; Technical memo. no. EDL-M101.
Order from LC mi $1.80, ph $1.80 PB 134 583

A 2- to 4-kmc stripline band-pass filter is described that has less than 1-db insertion loss throughout its pass band. A brief experimental treatment lists design pitfalls and how to avoid them. Drawings of the case and stripline details are provided.

Electronics Research Lab., U. of Calif. Berkeley.
CURRENT DISTRIBUTIONS ON CIRCULAR CYLINDRICAL REFLECTORS, by Wilbur S. Chang and Samuel Silver. Aug 57, 34p. Contract N7onr-295 (29); Rept. no. 72; Series 60, Issue 193.
Order from LC mi $3.00, ph $6.30 PB 135 100

The work by Plonsey on cylindrical reflectors has been extended to test further (a) the extent to which the geometrical optics current distribution accounts for the beam formation by a reflector and (b) the range of applicability of the line sources at the edges introduced by Plonsey as representations for the local diffraction effects and the duration of the current distribution from the geometrical optics one.

Electronics Research Lab., U. of Calif. Berkeley.
SENSITIVITY OF AMPLIFIER INTERSTAGE NETWORKS TO CHANGES IN TERMINATING CAPACITANCES, by H.R. Hall and E.S. Kuh. July 57, 21p. Contract N7onr-295(29); Rept. no. 66; Series 60,

Issue 187.
Order from LC mi $2.70, ph $4.80 PB 134 484

A study of the sensitivity functions of amplifier interstage networks was undertaken in the hope of obtaining simple relations between the impedance functions and the sensitivity functions of the network. Such relations were obtained. They enable a designer to evaluate the relative change in output of a network for a given relative change in a capacitor in shunt with the network either at the input or at the output.

Electronics Research Labs., Columbia, U., New York.
COMPARATIVE EVALUATION OF SEVERAL AZIMUTH ESTIMATING PROCEDURES USING DIGITAL PROCESSING AND SEARCH RADAR SIMULATION, by Charlton M. Walter, Jack Atkin, and Henry Bickel. Dec 56, 49p. Contract AF 19(604)572; Technical rept. no. T-3/133; CU-6-56-AF 1572; AFCRC TN 56-983; AD-110 181.
Order from LC mi $3.30, ph $7.80 PB 134 989

An analytical process is described which characterizes a wide class of target detection and azimuth estimation techniques used in conjunction with pulsed search radars. This class includes such techniques as the scan density detector and estimator, the maximum likelihood estimators, and other detection and estimation schemes based on pulse integration.

Engineering Research Inst., U. of Michigan, Ann Arbor.
SIGNAL DETECTION AS A FUNCTION OF SIGNAL INTENSITY AND DURATION, by D.M. Green, T.G. Bridsall, and S.P. Tanner, Jr. Feb 57, 47p. Contract DA 36-039-sc-63203; Technical rept. no. 42; Rept. no. 2262-144-T; AD-131 749.
Order from LC mi $3.30, ph $7.80 PB 133 822

The object of this study was to determine how signal amplitude and duration effect the detectability of a pure tone partially masked by random noise. The study attempted to determine the surface of detectability in a space in which signal duration and amplitude are considered two dimensions in this task three experiments were conducted employing the same observers in each experiment. In the first experiment signal duration was held constant while amplitude was varied. In the second experiment signal energy was held constant while various pairs of values for signal duration and amplitude were tested. Finally signal amplitude was held constant while signal duration was varied. A three parameter equation was determined which provided a reasonable fit to this surface of detectability in the plane of signal amplitude and duration. The equations are consistent with the data of previous research in this area. Finally, a comparison of the results and the predictions generated by a simple filter model is discussed.

Hughes Aircraft Co., Culver City, Calif.
NOTE CONCERNING THE RADAR CONTRAST OF AIRPORT RUNWAYS, by Francis Richey. Feb 57, 18p. Contract AF 19(604)1708; Scientific rept. no. 2; AFCRC TN 57-198; AD-117 039.
Order from LC mi $2.40, ph $3.30 PB 132 193

The radar contrast of a perfectly absorbing gap surrounded by reflecting semi-infinite half planes has been derived as a special example of a theory giving the radar contrast of any extended target complex. The radar contrast is defined in terms of the power received at the antenna and does not take into account the effects of noise. By comparing the contrast of an absorbing gap with that obtained for two point sources of angular separation equal to the width of the gap, an explanation is given of the unexpectedly good results obtained by side-looking reconnaissance radars in resolving airport runways of angular widths four or five times smaller than a half-power beamwidth.

Levinthal Electronic Products, Inc., Palo Alto, Calif.
PULSED TRAVELING WAVE TUBES, by Gordon S. Kino. Oct 55, 17p. Contract AF 30(635)2813; Technical rept. no. 2; RADC TN 57-193; AD-114 485. Levinthal rept. no. 105.
Order from LC mi $2.40, ph $3.30 PB 135 259

Two cases are considered in this study. The first is the case where the r-f is pulsed and the electron beam kept on for a period considerably longer than the length of the pulse. The second is the case where the beam is pulsed and the input r-f signal applied for a considerably longer time than the pulse width required.

Linfield Research Inst., McMinnville, Oreg.
FIELD EMISSION CATHODE RAY TUBE DEVELOPMENT, by Joseph W. Griffith and Winthrop W. Dolan. July 58, 37p. Contract AF 33(616)3734; WADC TR 58-8; AD-155 723.
Order from OTS $1.00 PB 151 246

The design, construction and preliminary testing of a cathode ray tube utilizing a field emission cathode constitute the subject matter of this report. Magnetic focusing of the field emission beam was investigated and experimentally demonstrated, but the chief emphasis of the work was placed upon electrostatic focusing. A detailed analysis of the corresponding electron optical problem was made. Based upon this analysis, a tube was designed, built, tested and demonstrated. Its performance indicates favorable possibilities for further development of such tubes, taking advantage of the attractive features of the field emission source.

Microwave Lab., Stanford U., Calif.
DEVELOPMENT OF HIGH-POWER TRAVELING-WAVE AND HYBRID TUBES, by Marvin Chodorow and E.L. Ginzton. Quarterly scientific rept. no. 2, 15 Oct 56-15 Jan 57. May 57, 19p. Contract AF

19(604)1924; ML 386; AFCRC TN 57-385; AD-117 090.
Order from LC mi $2.40, ph $3.30 PB 132 205

Summarizes progress under three projects: Cloverleaf travelling-wave tube project, gridded electron gun project, and a study of multi-cavity klystrons.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N.Y.
BROADBAND, BEAD-SUPPORTED COAXIAL LINES AND FITTINGS, by Paul G. Mariotti. Final rept. Aug 54, 89p. Contract DA 36-039-sc-42500; Rept. no. R393-54; PIB-326.
Order from LC mi $4.80, ph $13.80 PB 132 951

Broadband line sections and components were developed for 7/8" coacial line covering the frequency range of 0-4. KMC, for 1-5/8" coaxial line covering the frequency range of 0-2.5 KMC, and for the 3/8" "Styroflex" line covering the frequency range of 0-11. KMC. Transitions between line sizes were also developed. These designs were based on a common characteristic impedance of 50.0 ± 1.0 ohms for all lines and the development of new broadband low reflection inner conductor couplers and low reflection dielectric supports. The inner conductor couplers have the desirable characteristic of being insensitive to reasonable axial displacement of the inner conductor such as encountered in normal mal practice. A theoretical analysis is presented for a coaxial line having a helical dielectric support (Styroflex). Some comparison is made between calculated and measured attenuation response for this type of line.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N.Y.
DESIGN OF "L" AND "T" TYPE DISSIPATIVE NETWORKS FOR BROADBAND MATCHING OF AN ARBITRARY LOAD, by Marian Tsai Wang. Thesis, Aug 57, 87p. Contract Nonr-839(05); Rept. no. R-593-57; PIB-521.
Order from LC mi $4.80, ph $13.80 PB 135 095

An arbitrary load is perfectly matched over a prescribed broad frequency-band to a constant-resistance generator by means of a linear, passive, reciprocal, dissipative two-terminal-pair network which is composed of an ideal transformer in tandem with an L-or T-pad (or π) of lumped elements. The problem of designing the matching network to dissipate a minimum of power is considered and solved in a number of cases. An analytic method of determining the limitation on the optimum matching is presented in the case that an L-type matching network is employed so that a designer is able to predict the best possible performance for any given load.

Sprague Electric Co., North Adams, Mass.
SOLID ELECTROLYTE BATTERY SYSTEMS, by Donald Smyth. Final rept. 1 June 54-30 Nov 56. Dec 56, 282p. Contract DA 36-039-sc-63151.
Order from OTS $4.00 PB 131 796

This report describes the work loading to the development of the $Ag/AgCl/KICl_4$ cell system and the cup-shaped cell configuration. This combination results in a noval cell of outstanding properties which appears to be capable of meeting the original goals of the contract. The various cell systems studied and the important features of each of these reported in detail in the main text. Supplementary material is discussed in the various Appendices: A. Detailed discussion of current-voltage relations in mixed conductors. - B. Discussion of the silver-iodine tarnishing experiments. - C. Reaction wtth iodine and chlorine of silver containing cadmium. - D. Effect of ultraviolet radiation on the tarnishing reaction. E. Effect of small additions of cadmium chloride on the protective action of silver chloride. F. Anodized films of silver chloride as the solid electrolyte. - G. Electrical contacts at the silver-silver chloride interface. - H. Test results of $Ag/AgCl/AgI/I_2$ batteries. - I. Shorting of solid electrolyte batteries by a common electrolyte. J. Modification in cup-shaped cell assembly. - K. Fluoride cell systems.

Springfield Armory, Mass.
FEASIBILITY AND EVALUATION STUDY OF A UNIVERSAL FUNCTION GENERATOR, by E.H. Jakubowski. Oct 57, 12p. Contract DA 19-059-504-ORD-2548; SA TR 20-2806.
Order from LC mi $2.40, ph $3.30 PB 134 279

Design and development of universal function generators for use in analog computing circuits are discussed. In order to simulate operational characteristics of a weapon on an analog computer, several types of function generators are necessary. Circuitry for the elliptical function generator and the ring spring generator is presented.

Stanford Electronics Labs., Stanford U., Calif.
ON THE PROPERTIES OF MATCHED FILTERS, by D.W. Lytle. June 57, 194p. Contract Nonr-225(24) Technical rept. no. 17.
Order from LC mi $8.70, ph $30.30 PB 134 991

Matched filters are defined and their properties as optimum signal detectors discussed. The conditions under which matched filters are realizable are enumerated. The conditions for realizability are not unduly restrictive and a variety of synthesis methods are applicable. The method providing greatest flexibility and adaptability is the synthesis procedure which employs tapped delay lines. This mode of synthesis is based upon the sampling theorem of frequency limited time functions.

Syracuse U. Research Inst., N.Y.
DEFOCUS CHARACTERISTICS OF MICROWAVE REFLECTORS AND LENSES, by David K. Cheng. Final rept. 1 July 54 - 30 Sep 56. Nov 56, 62p. Contract AF 30(602)1360; EE317-5611F; RADC TR 57-86; AD-114 348.
Order from LC mi $3.90, ph $10.80 PB 135 189

The initial purpose of this contract was to investigate the on-axis and off-axis defocus characteristics of microwave reflectors with apertures of both the circular and the rectangular types. The investigation developed into three major tasks, namely: (1) Simulation of Fraunhofer radiation, patterns in the Fresnel region by a defocusing technique; (2) Determination of phase errors in an aperture plane of any given reflector with an arbitrarily located primary source; (3) Determination of aperture-field distributions for defocused microwave lenses which included metal-plate lenses, homogeneous dielectric lenses, and the Luneberg lens.

Technical Research Group, New York.
MUTUAL COUPLING OF SHUNT SLOTS IN THE BROADFACE OF STANDARD RECTANGULAR WAVEGUIDE, by Alan F. Kay and Alan Simmons. Final rept. Mar 58, 98p. Contract AF 19(604) 2453; AFCRC TR 58-135; AD-152 377.
Order from LC mi $5.40, ph $15.30 PB 135 215

For a large number of cases, the internal reflection and transmission coefficients and the radiation patterns of two nearby shunt slots in the broadface of standard waveguide have been measured and the results compared with theory both including and neglecting mutual coupling (i.e., coupling by other than the dominant waveguide mode).

Technical Research Group, New York.
TOPICS IN ANTENNAS AND RADOMES, by Alan F. Kay. Final rept. Jan 58, 23p. Contract AF 19(604)1307; AFCRC TR 58-104; AD-146 804.
Order from LC mi $2.70, ph $4.80 PB 134 992

Seven topics in applied electromagnetic theory were investigated: 1) Surface waves and anisotropic propagation, 2) Techniques for measuring far field data at close distances, 3) Mutual coupling of slots in waveguide, 4) Radome survey, 5) Microwave filters, 6) Electromagnetic field in a half space, and 7) A new type of lens.

Tufts U., Medford, Mass.
EXCITATION OF SURFACE WAVES IN A DOUBLE DIELECTRIC WAVEGUIDE, by Albert D. Frost. Scientific rept. no. 1, 15 Nov 56-15 June 57. July 57, 41p. Contract AF 19(604)2154; AFCRC TN 57-564; AD-117 285.
Order from LC mi $3.30, ph $7.80 PB 132 204

A study has been made of some of the properties of a single dipole as a means for the excitation of surface waves in a grounded dielectric slab. Factors affecting the effectiveness of the dipole as a surface wave source are reported in detail. Experiments on the use of an additional reflector plate or strip are described together with measurements on change in dipole resonant length as a function of plate position and dielectric thickness.

Wayne State U., Detroit, Mich.
STATISTICAL DEVELOPMENTS IN LIFE TESTING, by Benjamin Epstein. June 57, 15p. Contract Nonr-216300; Technical rept. no. 1.
Order from LC mi $2.40, ph $3.30 PB 134 345

Describes recently developed statistical methods for analyzing data arising from life tests and for designing life tests. Most of the results have been obtained under the assumption of an exponential distribution of life. Replacement, non replacement, sequential, non sequential, and truncated procedures are described. Some useful tables are given at the end of the paper.

Mechanical Engineering

David Taylor Model Basin, Washington, D.C.
VIBRATIONAL MANUAL FOR ENGINEERS, by Robert R. McGoldrick. 2nd ed. Dec 57, 33p. Rept. no. R-189.
Order from OTS $1.00 PB 131 785

This manual contains a collection of formulas useful to design engineers in their efforts to minimize trouble from mechanical vibration. The formulas conform with a notation based on the inch-pound-second (ips) system of units unless specifically stated otherwise. (See also PB 85 807)

National Advisory Committee for Aeronautics, Washington, D.C.
EFFECT OF TEMPERATURE ON DYNAMIC MODULUS OF ELASTICITY OF SOME STRUCTURAL ALLOYS, by Louis F. Vosteen. Aug 58, 19p.
Order as TN 4348 from National Aeronautical and Space Administration, 1520 H St., N.W., Washington 25, D.C.

The effect of temperature on Young's modulus of elasticity was determined from flexural beam vibration tests for 2024-T3 and 7075-T6 aluminum alloys. AZ31A-0 magnesium alloy, RS-120 titanium alloy, and type 303 stainless steel at temperatures from room temperature to 900°F. The test frequencies were varied from 40 to 550 cycles per second. The results are compared with values of moduli obtained from conventional stress-strain tests. The data show that the dynamic modulus decreases with temperature but does not decrease as rapidly as the static modulus. It is shown that the difference between the static modulus and dynamic modulus is due to internal friction and cannot be attributed to creep.

Ordnance, Missiles, and Satellite Vehicles

Air Force Cambridge Research Center, Bedford, Mass.
ORBITAL MOTION OF THE EARTH SATELLITE 1957β FROM 1 APRIL 1958 to its decay 14 April 1958, by G. R. Miczaika and E. W. Wahl. June 58,

38p. AFCRC TN 58-445; AD-152 621.
Order from OTS $1.25 PB 151 249

The orbital motion of the Russian artificial earth satellite 1957 β between 1 April 1958 and 14 April 1958, the day of its disintegration, is discussed. The analysis is based on all positional observations available to the Project Space Track prior to 22 May 1958. These observations are listed in a catalog. Included in the study are descriptive reports on the decay phenomena as observed from ships and island in the Caribbean Sea.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
AIR BLAST MEASUREMENTS ABOUT EXPLOSIVE CHARGES AT SIDE-ON AND NORMAL INCIDENCE, by A.J. Hoffman and S.N. Mills, Jr. July 56, 41p. Rept. no. 988.
Order from LC mi $3.30, ph $7.80 PB 134 283

Measurements of air blast peak pressures, positive impulses, and positive durations for both side-on and normal incidence from bare 50/50 spherical pentolite changes are presented. The explosive weight ranged from 1/2 to 8 pounds, the scaled distance from 1.48 to 14.81 ft/$lb^{1/3}$. Results of two hundred and sixty-nine test firings are tabulated and presented graphically. A description is given of the piezoelectric gage developed to measure the blast in the normal incident waves.

Human Engineering Lab., Aberdeen Proving Ground, Md.
EVALUATION OF 50 AND 80 LB AMMUNITION CONTAINERS AND RECOMMENDATION FOR IMPROVED PACKAGE DESIGN, by Samuel A. Hicks and Claude N. McCain. June 58, 13p. Technical memo. no. 5-58.
Order from LC mi $2.40, ph $3.30 PB 135 118

The study compared the efficiency with which two different weights of ammunition containers (50 and 80 lbs) could be man-carried across a one hundred and fifty yard course of irregular terrain. It was concluded that under test or assumed normal conditions two 50 lb. containers were an optimal load for a single ammunition bearer. An ammunition package design concept was formulated embodying a combination folding top handle and lock actuating lever, and a detachable side handle.

Naval Research Lab., Washington, D.C.
PROJECT VANGUARD REPORT NO. 36. MINITRACK REPORT NO. 8: TIME STANDARD, by C.A. Schroeder, E.J. Habib, and W.R. Silvester. Oct 58, 48p. NRL 5227.
Order from OTS $1.25 PB 151 169

The "Minitrack" system for tracking an artificial earth satellite, which has been developed as a part of Project Vanguard, is described briefly, and the time standard equipment which provides the system time reference is described in detail. The measments made by the Minitrack system are phase comparisons between signals received on five pairs of antennas. The time standard provides the means for synchronizing the system with WWV time signals to an accuracy of ± 1 millisecond, the 500-cps separation frequency for the receivers, the means for synchronizing the operation of the digital phase meters with the standard time, and the time bases for the data records. The detailed test specifications for the time standard, and details of the counters, are given in Appendixes. For Minitrack reports no. 1-7 see PB 131 220, 131 330, 131 390, 131 396, 131 961, 151 112, 151 163.

Picatinny Arsenal, Dover, N.J.
PREPARATION AND EXPLOSIVE PROPERTIES OF TRIPENTAERYTHRITON OCTANITRATE, by Joseph J. LaMonte, Henry J. Jackson and others. June 58, 24p. Technical rept. no. 2490.
Order from LC mi $2.70, ph $4.80 PB 135 094

Tripentaerythritol octanitrate (TPEON) has been prepared on a laboratory scale and has been subjected to a preliminary evaluation for use in ammunition. The nitration of both 97% and 99% tripentaerythritol (TPE) using 99% nitric acid at 0°C proceeds smoothly to give yields of crude octanitrate which are practically quantitative. The octanitrate prepared from the 97% pure tripentaerythritol is exceedingly difficult to obtain in a pure crystalline form and shows a very pronounced tendency to form a viscous syrup when coming out of solution. When the octanitrate is prepared from the tripentaerythritol of of 99% purity, pure material (mp 82–84°C) can be obtained by recrystallization from chloroform. The purified material passes the 120°C vacuum stability test (1.94 ml gas) has an impact sensitivity of 9 inches, a sand test value of about 58 grams, and a detonation velocity of 7650 m/s at a density of 1.56 and a charge diameter of 1/2 in. (unconfined). It is possible to prepare low-melting mixtures of TPEON and dipentaerythritol hexanitrate (DPEHN). These compounds may be used as possible plasticizers for cellulose nitrate.

Picatinny Arsenal, Dover, N.J.
QUALIFICATION OF NORTH AMERICAN SULFITE WOOD PULPS FOR USE IN THE MANUFACTURE OF MILITARY GRADES OF NITROCELLULOSE, by K. Russell. May 58, 21p. DB TR 4-58.
Order from LC mi $2.70, ph $4.80 PB 134 894

Pitman-Dunn Labs., Frankford Arsenal, Philadelphia, Pa.
PERFORMANCE EVALUATIONS OF POLYTETRA FLUOROETHYLENE LUBRICATED SMALL ARMS, by F. Verderame and J. Messina. Feb 58, 18p. Memo. rept. no. 666.
Order from LC mi $2.40, ph $3.30 PB 134 632

In general, the polytetrafluoroethylene on many gun parts appeared to be worn after a relatively short firing period. It was also observed that many parts rusted and pitted during the tests. These conditions,

however, did not seem to affect the over-all operability of the weapons. Accelerated humidity cabinet rust tests indicate that polytetrafluoroethylene may be suitable as a protective coating for small arms.

Purdue U. School of Aeronautical Engineering, Lafayette, Ind.
GENERAL VARIATIONAL THEORY OF THE FLIGHT PATHS OF ROCKET-POWERED AIRCRAFT, MISSILES AND SATELLITE CARRIERS, by Angelo Miele. Jan 58, 77p. 16 refs. Contract AF 18(603)690; Rept. no. A-58-2. AFOSR TN 58-246; AD-154 148.
Order from LC mi $4.50, ph $12.30 PB 134 756

An investigation of a wide class of variational problems of interest in the mechanics of flight of rockets has been undertaken. Detailed aspects of the theory of the optimum burning program have been considered. The paths considered are of a general, curvilinear nature; the earth is spherical; the acceleration of gravity is variable. Furthermore, and more important, three degrees of freedom characterize the broad aspects of the present investigation. The latter is concerned with the simultaneous determination of the time history of modulus of the thrust, direction of the thrust and angle of attack. General equations are presented covering a wide group of variational problems of the mechanics of flight.

Samuel Feltman Ammunition Labs., Picatinny Arsenal, Dover, N. J.
IMPROVEMENT OF COMPOSITION B AND HBX COMPOSITIONS, by Robert W. Heinemann. May 58, 31p. Technical rept. no. 2513.
Order from LC mi $3.00, ph $6.30 PB 134 406

For the present investigation HBX and Composition B samples, with and without desensitizer, have been given the following tests: laboratory impact, friction pendulum, rifle bullet impact, sensitivity to setback pressure, sensitivity to heat.

Samuel Feltman Ammunition Labs., Picatinny Arsenal, Dover, N. J.
POTENTIAL APPLICATIONS OF RADIOISOTOPES TO PROCESS AND QUALITY CONTROL IN THE MANUFACTURE OF PROPELLANTS AND EXPLOSIVES, by Samuel Helf, Thomas C. Castorina, and Frederick S. Holahan. May 57, 20p. PA TR 2435.
Order from LC mi $2.40, ph $3.30 PB 132 952

Two general types of application have been found which are of particular interest to industrial ammunition agencies. These are (1) the use of radioisotopic gaging devices for automatic process control and for the measurement of end-item dimensions, and (2) the use of labeled compounds as a chemical analytical tool and in large-scale tracer operations.

Food

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
EVALUATION OF THE USAF FLIGHT FEEDING PROGRAM, by John K. Kooker, Jr., Albert A. Taylor and others. Sep 54, 82p. WADC TR 54-354; AD-55 423.
Order from LC mi $4.80, ph $13.80 PB 135 177

All commands operating aircraft were contacted letter questionnaire and the replies tabulated. A representative number of commands were visited to obtain additional information. Written material on flight feeding was screened, and authorities on the subject were interviewed. The procedures, meals and equipment now available for flight feeding, in most instances, meet present day peacetime operations. Sandwich snack meals, individual in-flight food packets, and precooked frozen meals are presently available for flight feeding. Foil pack meals, compact box lunches, liquid foods, and food tablets are currently being developed. Information indicates that in the event of war, flight food and equipment currently available or under development would meet wartime needs.

American Meat Inst. Foundation, Chicago, Ill.
STUDY OF IMPROVED FLAVOR AND STABILITY OF HAMS BY CONTROL OF CURING PROCESS, by C. F. Nives, Jr. Final rept 1 Dec 53-31 May 55. June 55, 29p. Contract DA 44-109-qm-1685; Rept. no. 16.
Order from LC mi $2.70, ph $4.80 PB 135 280

Army Medical Nutrition Lab., Denver, Colo.
ACCEPTABILITY OF IRRADIATED FOOD CONSUMED BY HUMAN SUBJECTS, by Virginia E. McGary, Margaret E. Shipman and others. Mar 57, 24p. Rept. no. 200.
Order from LC mi $2.70, ph $4.80 PB 135 354

The present studies were devoted primarily to the detection of possible toxic effects of irradiated foods on human subjects. In addition, data on the acceptability of irradiated to non-irradiated foods have been collected as a part of the main study.

California Agricultural Experiment Station, Davis.
RELATIONSHIP OF IRRADIATION INDUCED FAT OXIDATION AND FLAVOR, COLOR AND VITAMIN CHANGES IN MEAT, by A. L. Tappel. Final rept. 15 Jan 56-14 Mar 57. Apr 57, 23p. Contract DA 19-219-qm-381.
Order from LC mi $2.70, ph $4.80 PB 135 353

Emphasis is placed on the study of radiation induced quality changes in meat which might be important when the radiation process is carried out on a commercial scale. The research embodies a survey of

these changes in a large number of meats, including poultry and fish. In a number of instances, pure compounds and models are used in these studies.

California U., Berkeley.
EFFECT OF IONIZING RADIATIONS ON CAROTENOID STABILITY, by G. Mackinney. Final rept. 15 Nov 54-21 Feb 56. Mar 56, 11p. Contract DA 19-129-qm-254; Rept. no. 3.
Order from LC mi $2.40, ph $3.30 PB 135 350

Report on the stability to gamma-radiation from a Co^{60} source of carotenoids in tomatoes, carrots and prawn, both fresh and cooked; in frozen spinach af after thawing; in a mold (Phycomyces), in commercial corn oil, in oils extracted from carrot roots and from salmon; in solid films of pure crystalline beta-carotene and lycopene; in petroleum ether solutions; and finally of lycopene dissolved in pure methyl stearate, methyl oleate and methyl linoleate.

School of Aviation Medicine, Randolph AFB, Tex.
CONDITIONED FOOD AVOIDANCE ON A T-MAZE IN IRRADIATED RATS, by Robert K. White and Lynn W. Brown. Mar 58, 5p. Rept. no. 58-48; In cooperation with Radiobiological Lab., U. of Texas.
Order from LC mi $1.80, ph $1.80 PB 134 363

Washington State Coll., Pullman.
DEHYDRATION OF MILK: THE EFFECT OF THE QUALITY OF RAW MILK AND THE FAT CONTENT OF DRY MILK ON ITS ACCEPTABILITY AND STABILITY, by U.S. Ashworth. Final rept. 1 July 55-31 Oct 57. Nov 57, 62p. Contract DA 19-129-qm-322.
Order from LC mi $3.00, ph $10.80 PB 135 351

The objectives were to study the relationship of the bacterial quality of the milk to the flavor quality of the freshly made powder and to the flavor quality of the powder after storage at low and high temperatures, and to find whether a milk with less than the normal percentage of butterfat when dried would yield a product with better flavor stability than one containing the normal level; the minimum legal standard is 3.25% fat in milk corresponding to 26.% fat in the dried product.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

SELECTED BIBLIOGRAPHY ON PRECISION INSTRUMENT AND FLUID BEARINGS. See entry under Bibliography on page 3. PB 131 791

Engines and Propulsion Systems

Avion Div., American Car and Foundry Co., Paramus, N.J.
DEVELOPMENT OF CONTROL, FUEL CUT-OFF. C 1297 (XE-1/DPN, by Gerard L. Zomber. Final rept. 17 June 53-2 Aug 56. Dec 56, 94p. Contract DA 36-039-sc-52637; Avion rept. 849.
Order from LC mi $5.40, ph $15.30 PB 134 278

This control was developed as a missile component to provide for the reliable permanent closing of a switch upon receipt of a preselected audio signal. When operated in conjunction with a certain transponder beacon system, the control is to receive amplitude modulated pulses causing operation of a "squib" switch and thereby closing a pair of output contacts.

Giannini Research Lab., Santa Ana, Calif.
PROPULSIVE PROPERTIES OF HIGH INTENSITY PLASMA JETS, by A.C. Ducati and G.L. Cann. Feb 58, 137p. Contract AF 49(638)54; GRL TR-9. AFOSR TN 57-748; AD-136 736.
Order from LC mi $6.90, ph $21.30 PB 134 980

A basic study showing inherent propulsive characteristics of plasma jet engines. Emphasis is given to indicating some practical and little appreciated advantages of such a system and the several means available for there generation and control. Hydrogen and helium gases maybe generated as plasma jet propulsive materials and offer various advantages over other gases. Impulses higher than with chemical fuels.

National Advisory Committee for Aeronautics, Washington, D.C.
TEMPERATURE-PRESSURE-TIME RELATIONS IN A CLOSED CRYOGENIC CONTAINER, by Sidney C. Huntley. Feb 58, 21p.
Order as TN 4259 from National Aeronautical and Space Administration, 1520 H. St., N.W., Washington 25, D.C.

An experimental study with liquid nitrogen in a closed container showed that surface temperature controlled the tank pressure and verified the existence of temperature gradients that accounted for the increase in pressure above that calculated from the average liquid temperature. Stirring the liquid to equalize liquid temperatures caused a pressure reduction to the calculated value. Mixing the vapor increased the direct heat flow to the stable liquid layer at the surface, which resulted in an increase in pressure.

Naval Civil Engineering Research and Evaluation, Port Hueneme, Calif.
EVAPORATIVE COOLING OF INTERNAL COMBUSTION ENGINES, by E.J. Beck. Jan 58, 128p. Technical rept. R-008.
Order from LC mi $6.30, ph $19.80 PB 134 357

The report discusses the desirability of cooling internal-combustion engines by allowing the coolant to boil, then separating and condensing the vapors in a closed cycle at atmospheric or slightly higher pressure.

Rosemount Aeronautical Labs., U. of Minnesota, Minneapolis.
COMBUSTION CHANNELS OF THE PROPULSION RESEARCH LABORATORY, by C. C. Chang and D. G. DeCoursin. Mar 58, 45p. Contract AF 18(600) 1553; Research rept. no. 149; AFOSR TN-58-206; AD-152 247.
Order from LC mi $3.30, ph $7.80 PB 133 249

A description of the combustion channels of the Propulsion Research Laboratory is presented. The major equipment consist of two channels with test section sizes 2 x 4 x 12 inches and 4 x 6 x 20 inches. At present subsonic test sections are installed which permit velocities up to choking and pressure level variation from 3 inches Hga to atmospheric.

Manufacturing Equipment and Processes

Aberdeen Proving Ground, Md.
INVESTIGATION OF PHOSPHINE FORMATION IN PHOSPHORIC ACID METAL-CONDITIONING BATHS, by M. H. Swann and C. F. Pickett. Aug 55, 14p. Proj. TB 4-821 B, rept. no. 4; ELR 6.
Order from LC mi $2.40, ph $3.30 PB 133 603

Copies of reports were received from Mt. Ranier Ordnance Depot in May and June concerning cases of phosphine poisoning of employees operating metal derusting baths which contained phosphoric acid metal conditioner. Since this toxic substance had not been observed or reported previously in connection with metal conditioning, the Paint and Chemical Laboratory investigated the chemistry of phosphine formation.

Aberdeen Proving Ground, Md.
SURFACE PREPARATION OF METALS: METHOD OF CLEANING AND CONDITIONING DIE CAST ALUMINUM WINDSHIELDS PRIOR TO PAINTING, by Allen B. Reed, Jr. and C. F. Pickett. Dec 55, 9p. Proj. TB 4-771B, rept. no. 3, EL rept. no. 9.
Order from LC mi $1.80, ph $1.80 PB 133 609

Die cast aluminum windshields were cleaned, given a conversion coating, painted and tested in salt spray box. After 150 to 300 hours slat spray exposure, the windshields were rated according to the amount of blistering and corrosion found on them.

Applied Mathematics and Statistics Lab., Stanford U., Calif.
SAMPLING PLANS FOR INSPECTION BY VARIABLES, by Gerald J. Lieberman and George J. Resnikoff. Mar 54, 56p. Contract N6onr-251(26); Technical rept. no. 13; AD-27 346.
Order from LC mi $3.60, ph $9.30 PB 134 305

A matching collection of variable sampling plans based on known standard deviation, unknown standard deviation, and average range is presented. The general theory is discussed, and general inspection procedures are given for each plan together with a numerical example for each plan. Tables and operating characteristic curves are included for each of the plans.

Pitman-Dunn Labs., Frankford Arsenal, Philadelphia, Pa.
ELECTROLYTIC GRINDING OF TUNGSTEN CARBIDE, by F. Pearlstein. Feb 57, 19p. Rept. no. 1373.
Order from OTS 50 cents PB 131 792

Electrolytic grinding of carbide at more than five volts indicated carbide removal in conformance to Faraday's law. Sparking usually occurred at more than 11 volts, with a characteristic decrease in grinding efficiency and pitting of the ground surface. There is some evidence that sparking occurs at low voltages when grinding with small areas of contact. Increased wheel speed resulted in an increase of the maximum rate of metal removal up to 6000 surface feet per minute. About five cubic inches of carbide were electrolytically ground without detectable wear on the single-layer diamond wheel. Using the form wheel to electrolytically re-form worn chipped tools, more than double the number of regrinds was obtained than by conventional regrinding practices.

Transport, Traction and Hoist Facilities

Aberdeen Proving Ground, Md.
TEST OF REMOVABLE SWIVEL HOOKS FOR TIRE CHAINS, by R. N. Cuevas. Aug 57, 17p. Rept. no. DPS/TT1-649/53; AD-142 535.
Order from OTS 50 cents PB 151 290

To determine the over-all suitability of tire chains equipped with removable swivel hooks as compared with standard chains, including evaluation of construction quality, ease of installation, mobility, and effects the swivel hooks might have on the durability of the chains; and the general operating characteristics of the chains equipped with the hooks.

MATERIALS

Swedlow Plastics Co., Los Angeles, Calif.
TENSILE AND TENSILE-FATIGUE PROPERTIES OF TRANSPARENT ENCLOSURE ATTACHMENTS FOR AIRCRAFT, by Raymond D. Liggett, Elber Latham, and J. G. Stansbury. Apr 53, 61p. Contract AF 33 (038)22456; WADC TR 53-106; AD-20 650.
Order from LC mi $3.90, ph $10.80 PB 135 204

Fifteen types of edge attachments, eight for monolithic acrylic material and seven for laminated

acrylic material were designed, fabricated and tested for tensile strength at room temperature and -65°F, and for tensile-fatigue at room temperature.

Ceramics and Refractories

Battelle Memorial Inst., Columbus, Ohio.
PROPERTIES OF CONVENTINNAL CERAMICS, by R.C. Fulmer, L. Loch and others. Apr 48, declassified 26 Oct 54, 226p. NEPA 548-BAT-9; ATI-33 009.
Order from LC mi $9.90, ph $34.80 PB 135 665

The purpose of this report is to bring together some of the existing information concerning the physical or mechanical properties of conventional products of possible interest to design engineers, scientists, and technologists for their ready reference. It discusses fire-clay, kaolin, alumina and silica bricks, various refractories, and properties of stoneware, clay sewer pipe, drain tile, and commercial glasses.

Illinois U., Urbana.
THE EFFECTS OF PRE-COMPRESSION ON THE THERMAL SHOCK RESISTANCE OF PURE OXIDE CERAMICS, by Darwin Marshall and Dwight G. Bennett. May 54, 21p. Contract AF 33(616)87; WADC TR 54-27; AD-38 146.
Order from LC mi $$2.70, ph $4.80 PB 135 072

A combination thermal cycling and compressive loading apparatus was constructed for investigating the effects of pre-compression on the thermal shock resistance of a pure oxide ceramic body. It was found that selective compressive loads applied in the direction of the long axis of a rectangular bar composed of alpha alumina effectively increased its thermal shock resistance. This was indicated by a progressive increase in the average modulus of rupture of each of several groups of bars; each group being uniformly thermal shocked at a compressive load of 1000, 3500 and 7000 psi, respectively. It was also found that about one half of the total improvement was obtained with the initial load of 1000 psi. The sonic technique was used as a method of detecting flaws in thermal shocked but unloaded specimens. When specimens were thermal shocked in compression, however, the sonic method, as used in this investigation, was unable to indicate the presence of flaws.

Inst. for the Study of Rate Processes, U. of Utah, Salt Lake City.
DECORATIONS OF DISLOCATIONS IN CORUNDUM BY VOIDS, by Robert J. Scheuplein and Peter Gibbs. July 57, 9p. Contract Nonr-1288(03); Technical rept. no. 11.
Order from LC mi $1.80, ph $1.80 PB 134 968

Edge dislocations have been decorated with voids in a deformed corundum (Al_2O_3) crystal by quenching. The cavitation occurs in a plane about 10 microns below the surface. Proof of the role of dislocations is obtained by etching. It is suggested that the occurence of cavitation rather than climb may be due to the presence of vacancy clusters in the heated sample.

Minerals Research Lab., U. of Calif., Berkeley.
MECHANICAL PROPERTIES OF SOME IONIC MATERIALS AND THE EFFECT OF SURFACE CONDITIONS ON THEIR ROOM TEMPERATURE DUCTILITY, by Earl R. Parker, J.A. Pask, and others. Nov 57, 26p. Contract AF 49(638)56; Series 109, Issue 1; AD-136 715.
Order from OTS 75 cents PB 131 789

The preliminary work completed to date has shown that cubic ceramic crystals possess substantial amounts of ductility at room temperature. Even the refractory ceramic material, magnesium oxide, elongated as much as 20 percent on the tension side of a single crystal bend-test specimen. Purity and environmental effects play a major role brittleness. There seems to be little or no reason to doubt that some ductile polycrystalline ceramic materials will be forthcoming within the next few years.

New York State Coll. of Ceramics, Alfred.
EVALUATION TECHNIQUES FOR HIGH TEMPERATURE METAL-CERAMIC MATERIALS, by W.B. Crandall and M.A. Tuttle. Sep 52, 27p. Contract N6ori-143; ATI 198 388.
Order from LC mi $2.70, ph $4.80 PB 134 429

Presented at Symposium on High Temperature Chemistry, University of Chicago, Apr 23-25, 1952.

Tests for evaluating ceramics include thermal diffusivity, thermal expansion, oxidation penetration, tensile strength, and thermal shock.

Fuels, Lubricants, and Hydraulic Fluids

Aberdeen Proving Ground, Md.
ANODIZED PISTONS IN BRAKE SYSTEMS SIMULATING STANDBY STORAGE. TEST OF HYDRAULIC FLUIDS FOR RECOIL AND HYDRAULIC MECHANISM, HYDRAULIC BRAKES, POWER TRANSMITTING FLUIDS, by C.B. Jordon, C.F. Pickett, and R.P. Witt. Nov 54, 11p. Proj. TB 5-5010F, rept. no. 31; LSD 236.
Order from LC mi $2.40, ph $3.30 PB 133 612

Systems simulating standby storage of brake mechanisms, consisting of one master cylinder and four wheel cylinders containing anodized pistons, were packed with one brake fluid known to have good storage properties, one brake fluid, known to have poor storage properties, and one hydraulic brake preservative compound meeting Specification MIL-P-12098 (Ord). This report contains the results of periodic inspections made on these systems.

Aberdeen Proving Ground, Md.
STUDY OF CORROSION INHIBITORS AND ANTI-OXIDANTS FOR ALCOHOLS FOUND IN HYDRAULIC BRAKE FLUIDS. TEST OF HYDRAULIC FLUIDS FOR RECOIL AND HYDRAULIC MECHANISM, HYDRAULIC BRAKES, POWER TRANSMITTING FLUIDS, by C.B. Jordon and C.F. Pickett. Dec 55, Proj. TB 5-5010F, rept. no. 32; ELR 28.
Order from LC mi $2.70, ph $4.80 PB 133 607

Three types of solvents, glycols, alcohols, and glycol-ethers, were chosen as representative solvents found in hydraulic brake fluids. Corrosion tests were run on these solvents using the procedure outlined under paragraph 4.4.2.11 of Federal Specification VV-F-451a. Different combinations of commercially available inhibitors and antioxidants were added to the solvents. This report contains the results of the corrosion tests which were run on the alcohols.

Armour Research Foundation, Chicago, Ill.
STUDIES TO DETERMINE THE ELECTRICAL AND PHYSICAL PROPERTIES OF AIRCRAFT LUBRICATING OILS, by Joseph L. Radnik. Sep 52, 157p. Contract AF 33(038)3793; WADC TR 52-220; ATI-187 966.
Order from LC mi $7.50, ph $24.30 PB 135 096

To assist in evaluating the capacitance type fuel quantity gage for use with oils, a study was made of various grades of aircraft lubricating oils. Measurements of dielectric constant, dissipation factor, and density were made on 144 new and used specimens of aircraft lubricating oils of grades 1100, 1080, 1065, 1010 and 1005 under the influence of changing frequency and temperature. Special studies were made to determine the effects of dilution with aviation fuel, the effect of additive compounds, and the effect of oil clinging to the sides of the sensing element of the gage.

Continental Oil Co., Ponca City, Okla.
BASIC STUDY ON DEVELOPMENT OF DIESTERS WITH IMPROVED THERMAL AND HYDROLYTIC STABILITY, by A.M. Durr, Jr. and C.E. Thompson. Rept. for Mar 57-Mar 58. 80p. Contract AF 33(616)5112; WADC TR 58-170, pt. 1; AD-155 616.
Order from OTS $2.00 PB 151 265

This report describes the preparation, synthesis, and testing of dibasic acid diesters with substituents near the reactive centers, the literature study made to establish a sound theoretical basis, and procedures for these preparations. The objective was to improve the thermal and hydrolytic stability of dibasic acid diesters which are currently of interest as synthetic lubricants.

National Bureau of Standards, Washington, D.C.
NET HEAT OF COMBUSTION OF AVIATION GASOLINE AND ITS CORRELATION WITH COMPOSITION AND ANILINE-GRAVITY PRODUCT, by George T. Armstrong, Ralph S. Jessup, and Thomas W. Mears. Rept. for 1 Dec 54-30 June 56; July 56, 33p. Contract AF 33(616)55-6; WADC TR 56-504; AD-110 659.
Order from LC mi $3.00, ph $6.30 PB 134 977

Forty aviation gasolines of grade 100/130 and 115/145 were selected in such a way as to attempt to provide a representative sample of gasolines of the latter type, and to provide a sufficient range of aniline-gravity product to permit a reliable correlation with heat of combustion.

Rubber and Elastomers

Hooker Electrochemical Co., Niagara Falls, N.Y.
INVESTIGATION OF CONDENSATION TYPE ELASTOMERS, by George C. Schweiker, Russell R. White and Rudolph N. Deleo. Rept. for 1 June 54-1 June 55. May 55, 58p. 24 refs. Contract AF 33(616)2421; WADC TR 55-221; AD-69 978.
Order from LC mi $3.60, ph $9.30 PB 135 194

Includes summary progress report on Fluorine-Containing Monomers for Condensation Polymers, by Earl T. McBee and Carleton W. Roberts. Apr 55.

The ultimate goal of the exploratory investigations described is the development of a rubber for special Air Force applications. High thermal stability and resistance to fuels, synthetic oils and hydraulic fluids are major requirements for such elastomers. Various fluorine- and sulfur-containing difunctional compounds have been prepared and high molecular weight polyesters have been synthesized. The linear polyesters made from fluorine-containing glycols exhibit rubber-like properties and are not brittle at low temperatures, in some cases. When fluorine is contained in these polyesters in adequate amounts, they are resistant to hydrocarbon solvents. Preliminary cross-linking experiments have given a tough elastomer from hexafluoropentylene adipate, without added reinforcing fillers. The materials described are the first examples of fluorine-containing polycondensation elastomers and appear to be of considerable interest.

Rock Island Arsenal Lab., Ill.
PRESERVATION OF TIRES IN OUTDOOR STORAGE AT ROCK ISLAND, ILLINOIS, by Edward W. Bergstrom. Jan 58, 42p. Lab. rept. 58-106.
Order from LC mi $3.30, ph $7.80 PB 134 358

Various methods of protecting Army Ordnance tires from atomspheric ozone attack were investigated, namely, the use of ozone resistant coatings (polyvinyl chloride and polychloroprene); the use of various external coverings (isobutylene/isoprene inner tube, bag type, etc.); the incorporation of antiozonants into the rubber prior to the curing of the tire; and external application of an antiozonant/solvent coating. Results are reported on tires which have been exposed outdoors on a roof at this

installation for a period of from fourteen months to seven years.

MATHEMATICS

Aeronautical Research Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
USE OF SAMPLE QUASI-RANGES IN ESTIMATING POPULATION STANDARD DEVIATION, by H. Leon Harter. June 58, 40p. WADC TR 58-200; AD-151 200.
Order from OTS $1.00 PB 151 266

Estimates based on a linear combination of two quasi-ranges are considered, and a method is given for determining the weighting factor which maximizes the efficiency. An example illustrates the use of these estimates. For rectangular and exponential populations, the most efficient unbiased estimate based on one quasi-range are tabulated, together with their efficiencies, also the bias when estimated which assume normality are used.

Chicago U., Ill.
FUNDAMENTAL CONCEPTS IN THE THEORY OF SYSTEMS, by Burton P. Sauer. Final rept. Nov 57, 143p. Contract AF 33(616)2797; WADC TR 57-624; AD-155 741.
Order from OTS $2.75 PB 151 242

Section I is an expository discussion of digital processes containing a brief historical account of the conception of routine computational procedures in classical mathematics, an exposition of the Post-Turing analysis of uniform digital computation and of the so-called Universal Turing Machine, and the abstract idea of a digital process. It concludes with an example of self-reproducing behavior by a digitally organized process. Section II, "Discrete Linear Mechanisms," and Section III, "Continuous Mechanisms," present a treatment of the basic theory of pulsed and continuous servomechanisms, including as topics linearity, causality, time-invariance, stability, weighting kernals and weighting arrays, weighting functions and weighting sequences, discrete and continuous transfer functions, transients and the steady state, and the phase-attenuation relations. A special feature is the extensive treatment of stability in the time-varying case. Section IV contains an extensive development of weighting functions from the point of view of functional analysis. Interrelations between spaces of input functions, spaces of weighting functions, and classes of mechanisms are developed. In Section V, an important class of mechanisms known as finite automata is analyzed with the help of algebraic techniques. The main theorem (due to Kleene) provides an almost complete characterization of the tasks such mechanisms can perform. A number of formulations of this characterization are proved equivalent.

Columbia U., New York.
AN EXTENSION OF THE SAMPLING THEOREM TO THE CASE WHERE THE FREQUENCY SPECTRUM OF THE TIME FUNCTION EXISTS IN A FINITE NUMBER OF DISCRETE BANDS, by Peter Oden and James Glimm. Sep 57, 18p. Contract AF 18(600)677; Technical rept. no. T-22/B; CU-36-57-AF-677; AFOSR TN 57-716; AD-136 709.
Order from LC mi $2.40, ph $3.30 PB 132 979

In this paper it is shown that a function of time whose Fourier transform is non-zero only in a finite number of frequency bands can be exactly reconstructed from its values at a select number of sampling points which occur at an average frequency equal to the sum of the frequency bands along the positive and negative frequency axis. If the Fourier transform of the time function is symmetrical about the frequency origin, the sampling frequency is given by twice the sum of the band widths along the positive frequency axis.

Cornell U., Ithaca, N.Y.
LP CONVERGENCE OF FOURIER-BESSEL SERIES FOR 0 p 1, by Charles Standish. July 56, 6p. Contract AF 18(600)685; Rept. no. 51; AFOSR TN 56-305; AD-90019.
Order fromLC mi $1.80, ph $1.80 PB 134 414

The object of this note is to extend to Fourier-Bessel series a theorem of M. Riesz on Lp convergence of trigonometric series.

Cornell U., Ithaca, N.Y.
PROPERTY OF THE MULTINOMIAL DISTRIBUTION, by H. Kesten and N. Morse. Feb 58, 13p. Contract AF 18(600)331; Mechanical Engineering rept. no. 13; AFOSR TN 58-92; AD-148 142.
Order from LC mi $2.40, ph $3.30 PB 134 863

A property of the multinomial distribution is proved which is fundamental to the choice of sample size for the selection procedure described in the paper by Bechhofer, Elmaghraby, and Morse. A Single-sample Multiple-decision Procedure for Selecting the Multinomial Event which has the Highest Probability (to be published). Proof is given for the theorem of least favorable configurations. This theorem assembles the results of preceding lemmas. The main ideas of the result are contained in 2 lemmas which are proved by imposing certain conditions to permit reduction of the probability of a correction selection.

Cornell U., Ithaca, N.Y.
STOCHASTIC APPROXIMATION, by H. D. Block, 1956, 17p.
Order from LC mi $2.40, ph $3.30 PB 134 310

Cornell U., Ithaca, N.Y.
TWO-SAMPLE DISCISION PROCEDURES REQUIRING ALLOCATIONS IN THE SECOND SAMPLE, by Lionel Weiss. [1954] 6p.
Order from LC mi $1.80, ph $1.80 PB 134 309

Louisiana State U., Baton Rouge.
ARCS IN PARTIALLY ORDERED SPACES, by R.J. Koch. May 58, 9p. Contract AF 18(603)89;

AFOSR TN 58-397; AD-154 306.
Order from LC mi $1.80, ph $1.80 PB 134 757

A theorem is presented on the existence of arcs in partially ordered spaces, and several applications to topological semigroups. The hypotheses are motivated by the structure of the partially ordered set of principal ideals of a compact connected topological semigroups with unit.

North Carolina State Coll., Raleigh.
COMBINATORIAL ANALYSIS. PART II: A THEORY OF OCCUPANCY. DISTRIBUTIONS IN PARCELS (ELEMENTARY THEORY), by Jack Levine. May 57, 177p. Contract Nonr-870(00).
Order from LC mi $8.10, ph $27.30 PB 134 306

As in Part I, the work is based primarily on Mac Mahon's results in this field. The problem in which the number of objects is equal to the number of boxes is treated by reducing the problem to the expansion of a homogeneous product-sum, and then is treated with restrictions. The appendix contains a variety of new tables designed to obtain rapid solutions to certain types of distribution problems. (See also PB 125 630)

Purdue Research Foundation, Lafayette, Ind.
COMMUTATORS ON A HILBERT SPACE, by C. R. Putnam. Technical note no. 7 on Bounded Matrices with Non-Negative Elements. May 58, 8p. Contract AF 18(603)139; AFOSR TN 58-199.
Order from LC mi $1.80, ph $1.80 PB 135 375

Radio Corp. of America, Camden, N.J.
LOCATION OF THE POINT ON A CLOSED SURFACE WHICH IS AT THE LEAST DISTANCE FROM A FIXED POINT, by Bruce U. Glass. June 54, 9p. Technical memo. no. 100-2.
Order from LC mi $1.80, ph $1.80 PB 134 796

Given a closed surface, the point on the surface which is at the least distance from a fixed point is determined. The method is then applied to find the altitude of apoint in space if the coordinates of the point are known in a right handed rectangular coordinate system centered at a fixed latitude, longitude, and height above the earth's surface where the normal to the earth at the center of the system froms the Z axis and where the X and Y axes lie in the tangent plane with the Y axis pointing north.

Computing Devices

Air Force Inst. of Tech., Dayton, Ohio.
APPLICATION OF SYMBOLIC LOGIC TO DIGITAL COMPUTER DESIGN, by Donald R. Wippermann. Thesis, Mar 58, 91p. GE 58-17.
Order from LC mi $5.40, ph $15.30 PB 134 833

This thesis derives from the published information on formal symbolic logic a variety of methods which may be utilized by the electrical engineer to simplify the switching functions which describe digital computer or telephone switching networks. This material is presented here in a language suitable for the engineer who has an intellectual curiosity about the subject but is not necessarily acquainted with the terminology of switching circuit theory.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
MANUAL FOR MAGNETIC TAPE INPUT-OUTPUT UNIT FOR AN ERA 1103 DIGITAL COMPUTER, by Paul M. Kintner. Feb 57, 49p. Technical note no. 1107.
Order from LC mi $3.30, ph $7.80 PB 134 284

The Magnetic Tape Input-output Unit is designed to furnish a means of inserting the withdrawing data into and from an ERA 1103 digital computer. The Unit will insert data into the computer, utilizing the computer's I0A register and External Read (ER) order, at rates up to 1500 groups per second, one group consisting of eight bits of binary data. Data can be recorded out onto magnetic tape through the Unit, again utilizing the computer's I0A register and External Write (EW) order, at rates up to 3000 groups per second.

Jet Propulsion Lab., Calif. Inst. of Tech. Pasadena.
DEPI: INTERPRETIVE DIGITAL-COMPUTER ROUTINE SIMULATING DIFFERENTIAL-ANALYZER OPERATIONS, by Fred H. Lesh and Frank G. Curl. Mar 57, 31p. Contract DA 04-495-ORD-18; Memo. 20-141; AD-133361.
Order from LC mi $3.00, ph $6.30 PB 133 820

A routine simulating the operation of an analog computer was constructed for use on the digital computer at the Jet Propulsion Laboratory. This code, called DEPI as an abbreviation for differential-equations pseudo-code interpreter, provides much of the flexibility and ease of programing associated with analog-computer operation. A study was made in which the speed, accuracy, and flexibility of the DEPI system were compared with these attributes in other computers and computer programs. The vehicle of comparison was a standard missle-trajectory problem.

Servo mechanisms, Inc., El Segundo, Calif.
RESEARCH AND DEVELOPMENT ON MAGNETIC FILMS AND MAGNETIC MATRIX MEMORY UNITS, by E. R. Olson. Final rept. Apr 58, 47p. Contract AF 33(616)3039; WADC TR 57-707; AD-151 160.
Order from LC mi $3.30, ph $7.80 PB 135 053

This is the final report on a research and development contract on evaporated magnetic films and magnetic memory matrices. Methods and equipment for the deposition of thin films, fabrication of laminated elements, and testing of these elements are described in the report. Deposition

techniques included electron bombardment, direct evaporation, and spin coating of silicone resins. Nickel-iron alloy films were shown to exhibit certain desirable characteristics and memory units containing nickel-iron exhibited memory response characteristics. (See also PB 131 557)

MECHANICS

Aerodynamics and Pneumatics

Advisory Group for Aeronautical Research and Development, Paris, France.
PRESSURE MEASUREMENT IN ARMAMENT RESEARCH, by A. J. Cable. Mar 58, 14p.
Order as AGARD 177 from National Aeronautical and Space Administration, 1520 H St., N. W. Washington 25, D. C.

Report presented at the Pressure - Measurements Meetings, sponsored by the AGARD Wind Tunnel and Model Testing Panel, held from 24-28 Mar 1958, London, Eng.

A description is given of some typical pressure transducers (copper-crusher gauges, piezo-electric transducers and strain-gauge transducers) which have been developed and used at A. R. D. E. for internal ballistics research. A quartz piezo-electric transducer and a modified piston type strain-gauge transducer are being used for pressure measurements in the ARDE Hypersonic Wind Tunnels.

Arnold Engineering Development Center, Tullahoma, Tenn.
COMPARISON OF WIND TUNNEL AND FREE-FLIGHT TEST RESULTS, AGARD CALIBRATION MODEL A, by C. J. Schueler. Mar 58, 18p. 16 refs. Contract AF 40(600)700; AEDC TN-58-2; AD-152 042.
Order from LC mi $2.40, ph $3.30 PB 134 419

Presented at the 7th semi-annual meeting of the Supersonic Tunnel Association, Redstone Arsenal, Huntsville, Ala., Apr 1957.

A comparison has been made of the wind tunnel and free-flight dray results for AGARD Model A over a Mach number range from 2.0 to 4.0. The comparison indicated that one of the factors influencing the correlation of wind tunnel and free-flight drag measurements is the location of boundary-layer transition which is shown to be influenced by the heating and cooling of the boundary layer.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
EFFECTS OF REYNOLDS NUMBER, MACH NUMBER, SPIN RATE, AND OTHER VARIABLES ON THE AERODYNAMICS OF SPHERES AT SUBSONIC AND TRANSONIC VELOCITIES, by C. M. Sabin. Nov 56, 23p. Memo rept. no. 1044.
Order from LC mi $2.70, ph $4.80 PB 134 281

The effects of five common variables on the drag and Magnus force of spherical objects at subsonic and transonic speeds are discussed. Graphs are included to demonstrate these effects. The variables discussed include Reynolds number, Mach number, spin rate, airstream turbulence, and body surface roughness. An explanation of the mechanism of these effects is offered where it seems necessary.

Brown U. Div. of Applied Mathematics, Providence, R. I.
APPROXIMATE BOUNDARY-LAYER THEORY FOR SEMI-INFINITE CYLINDERS OF ARBITRARY CROSS-SECTION, by E. Varley. Jan 58, 32p. Contract AF 49(638)232; AFOSR TN 58-53; AD-148095.
Order from LC mi $3.00, ph $6.30 PB 133 227

An estimate is given of the distribution of skin frictional force per unit length, and of displacement area, on the outside of a semi-infinite cylinder, of arbitrary cross-sections, moving steadily in a direction parallel to its generators. A Pohlhausen method is employed with a velocity distribution chosen to yield zero viscous retarding force on the boundary layer approximations.

Guggenheim Aeronautical Lab., Calif. Inst. of Tech. Pasadena.
EXPERIMENTAL INVESTIGATION OF THE STABILITY OF THE HYPERSONIC LAMINAR BOUNDARY LAYER, by Anthony Demetriades. May 58, 96p. Contract DA 04-485-ORD-19; Memo no. 43.
Order from LC mi $5.40, ph $15.30 PB 135 142

An experimental investigation of the stability of the hypersonic laminar boundary layer was carried out for the case of a flat insulated surface at zero angle of attack. The stream-wise amplitude variation of both "natural" disturbances (i.e., flow fluctuations existing naturally in the boundary layer) and of disturbances artifically excited with a "siren" mechanism was studied with the aid of a hot-wire anemometer. In both cases it was found that such small fluctuations amplify for certain ranges of the fluctuation frequency and the Reynolds number R_0, and damp for others.

Institute of Engineering Research, U. of Calif., Berkeley.
EFFECT OF A DOWNSTREAM SPLITTER PLATE ON THE HEAT TRANSFER FROM A CIRCULAR CYLINDER NORMAL TO AN AIR STREAM, by R. A. Seban and A. M. Levy. Aug 57, 55p. Contract AF 33(616)348; Series 41, Issue 17; WADC TR

57-479; AD-155 765.
Order from OTS $1.50 PB 151 228

An experimental investigation has been made of the effect of a wake splitter plate on the heat transfer from a circular cylinder normal to an air stream. The information presented is also an addition to the knowledge of heat transfer in regions of two-dimensional separated flow. The results include local heat transfer coefficients, recovery factors, and pressure coefficients for the cylinder with and without the splitter plate for Reynolds Numbers from 53,000 to 236,000 and free stream Mach Numbers from 0.08 to 0.40.

National Advisory Committee for Aeronautics, Washington, D. C.
AERODYNAMIC RESEARCH ON FUSELAGES WITH RECTANGULAR CROSS SECTION, by Maruhn, Tr. by Peter R. Kurzhals. July 58, 37p.
Order as TM 1414 from National Aeronautical and Space Administration, 1520 H St., N. W. Washington 25, D. C.

Translation of "Aerodynamische Untersuchungen an Rümpfen mit recteckahnlichem Querschnitt." Jahrbuch 1942 der Deutschen Luftfahrtforschung, pp. 263-279 (Report by the Deutschen Versuchsanstalt fur Luftfahrt, E. V., Berlin-Adleshof, Institute for Aerodynamics.

The two-dimenstional flow characteristics around square and rectangular cross sections with rounded edges as calculated by conformal mapping techniques are presented and compared with corresponding results from elliptical and rectangular cross sections. A few examples of the fuselage induced rolling moment due to sideslip are presented.

National Advisory Committee for Aeronautics, Washington, D. C.
BOUNDARY-LAYER STABILITY DIAGRAMS FOR ELECTRICALLY CONDUCTING FLUIDS IN THE PRESENCE OF A MAGNETIC FIELD, by Vernon J. Rossow. Aug 58, 32p.
Order as TN 4282 from National Aeronautical and Space Administration, 1520 H St., N. W., Washington 25, D. C.

National Advisory Committee for Aeronautics, Washington, D. C.
DYNAMIC STABILITY OF VEHICLES TRAVERSING ASCENDING OR DESCENDING PATHS THROUGH THE ATMOSPHERE, by Murray Tobak and H. Julian Allen. July 58, 35p.
Order as TN 4275 from National Aeronautical and Space Administration, 1520 H. St., N. W. Washington 25, D. C.

An analysis is given of the oscillatory motions of vehicles which traverse ascending and descending paths through the atmosphere at high speed. The specific case of a skip path is examined in detail, and this leads to a form of solution for the oscillatory motion which should recur over any trajectory. The distinguishing feature of this form is the appearance of the Bessel rather than the trigonometric function as the characteristic mode of oscillation.

National Advisory Committee for Aeronautics, Washington, D. C.
EFFECT OF FLOW INCIDENCE AND REYNOLDS NUMBER ON LOW-SPEED AERODYNAMIC CHARACTERISTICS OF SEVERAL NONCIRCULAR CYLINDERS WITH APPLICATIONS TO DIRECTIONAL STABILITY AND SPINNING, by Edward C. Polhamus. Jan 58, 54p.
Order as TN 4176 from National Aeronautical and Space Administration, 1520 H. St., N. W. Washington 25, D. C.

Cylinders with several cross-sectional shapes (including squares having various corner radii, rectangles, and a triangle) were studied. Since the flow incidences correspond to combined angles of attack and sideslip in the crossflow plane of three-dimensional bodies, the two-dimensional side-force results appear to have strong implications with regard to directional stability at high angles of attack and these implications, along with those associated with spin characteristics, are briefly discussed.

National Advisory Committee for Aeronautics, Washington, D. C.
EFFECTS OF BOUNDARY-LAYER DISPLACEMENT AND LEADING-EDGE BLUNTNESS ON PRESSURE DISTRIBUTION, SKIN FRICTION, AND HEAT TRANSFER OF BODIES AT HYPERSONIC SPEEDS, by Mitchel H. Bertram and Arthur Henderson, Jr. July 58, 33p.
Order as TN 4301 from National Aeronautical and Space Administration, 1520 H. St., N. W. Washington 25, D. C.

Results are presented of an investigation to determine the effect of boundary-layer displacement and leading-edge bluntness on surfaces in hypersonic flow. The presence of the boundary-layer and the blunt leading edge induce pressure gradients which in turn affect the skin friction and heat transfer to the surface. Methods for predicting these phenomena on two-dimensional surfaces are given and a brief review of recent three-dimensional results is presented.

National Advisory Committee for Aeronautics, Washington, D. C.
EFFECT OF FABRICATION-TYPE ROUGHNESS ON TURBULENT SKIN FRICTION AT SUPERSONIC SPEEDS, by K. R. Czarnecki, John R. Sevier, Jr. and Melvin M. Carmel. July 58, 15p, diagrs, graphs.
Order as TN 4299 from National Aeronautical and Space Administration, 1520 H St., N. W. Washington 25, D. C.

The results of this investigation indicate that the effects of both Reynolds number and Mach number can be correlated on the basis of changes in flow characteristics within the inner parts of the boundary layer. Consequently, increasing the unit Reynolds number has a detrimental effect and increasing Mach number has a powerful alleviating effect on drag due to surface roughness. The correlation of the effects of changes in roughness height or shape awaits a more comprehensive analysis than was attempted in this paper. Further investigation must be made of the effects of roughness sweep and possible mutual interference effects.

National Advisory Committe for Aeronautics, Washington, D. C.
ESTIMATE OF THE FLUCTUATING SURFACE PRESSURES ENCOUNTERED IN THE REENTRY OF A BALLISTIC MISSILE, by Edmund E. Callaghan. July 58, 18p.
Order as TN 4315 from National Aeronautical and Space Agency, 1520 H St., N. W., Washington 25, D. C.
An analysis of the sound pressure levels encountered during the reentry of a blunt-nosed vehicle shows the probability of the existence of levels of 150 decibels or more. The exposure time to high levels is short, that is, of the order of 25 seconds. The results are presented in terms of dimensionless parameters, which cover a wide range of conditions in regard to body size and weight and reentrance angle and velocity.

National Advisory Committee for Aeronautics, Washington, D. C.
EXPERIMENTAL INVESTIGATION OF THE LATERAL TRIM OF A WING-PROPELLER COMBINATION AT ANGLES OF ATTACK UP TO 90° WITH ALL PROPELLERS TURNING IN THE SAME DIRECTION, by William A. Newsom, Jr. Jan 58, 27p.
Order as TN 4190 from National Aeronautical and Space Administration, 1520 H. St., N. W. Washington 25, D. C.

The investigation was conducted with a model having four propellers, the slipstream from which covered practically the entire span of the wing. Tests were made at angles of attack up to 90° for various differential flap deflections and differential blade pitch on the outboard propellers. The lateral trim of the configuration tested was marginal. It seems likely, therefore, that some tilted -wing vertical-take-off airplanes could be trimmed with all propellers rotating in the same direction whereas others could not.

National Advisory Committee for Aeronautics, Washington, D. C.
FLOW INDUCED BY A ROTOR IN POWER-ON VERTICAL DESCENT, by Walter Castles, Jr. July 58, 25p.
Order as TN 4330 from National Aeronautical and Space Administration, 1520 H. St., N. W., Washington 25, D. C.

Approximate equations are derived for the induced power required and blade loading of a lifting rotor operating in the power-on vertical-descent range. The approximate relations, which are based upon certain assumptions as to the nature of the flow pattern, yield, for the induced power variation, results which are in general agreement with avialable data.

National Advisory Committee for Aeronautics, Washington, D. C.
FULL-SCALE WIND-TUNNEL TESTS OF A 35° SWEPTBACK-WITN AIRPLANE WITH BLOWING FROM THE SHROUD AHEAD OF THE TRAILING-EDGE FLAPS, by William H. Tolhurst, Jr. July 58, 40p.
Order as TN 4283 from National Aeronautical and Space Administration, 1520 H St., N. W. Washington 25, D. C.

Data are presented showing the effect of flap position relative to the blowing nozzle on the air-flow requirements for boundary-layer control on flaps deflected from 45° to 75° at a Reynolds number of 7.5×10^{6}. A direct comparison of shroud blowing and flap blowing is shown for a plain flap configuration. Also presented are data showing the effect on the air-flow requirements of spacers in the nozzle, discontinuities on the flap upper surface, and of sealing the slot when the flap was in the single-slotted flap configuration.

National Advisory Committee for Aeronautics, Washington, D. C.
HEAT-TRANSFER AND PRESSURE MEASUREMENTS ON FLAT-FACED CYLINDERS AT A MACH NUMBER OF 2, by William E. Stoney, Jr. and J. Thomas Markley. July 58, 38p.
Order as TN 4300 from National Aeronautical and Space Administration, 1520 H St., N. W. Washington 25, D. C.

Flat-faced cylinders of 12-inch diameter and 4-inch diameter were tested at a Mach number of 2 and sealevel conditions in a preflight jet. The pressure data from the 4-inch-diameter model agreed well with the results of several other investigations. The stagnation-point pressure gradient was indicated to be about 30 percent of the gradient on a hemisphere of equivalent size. The heat-transfer data agreed reasonably well with the theoretical results when the flow was laminar. The stagnation-point heating rates of a flat face were approximately 55 percent of the stagnation heating rates on a hemisphere of equal diameter.

National Advisory Committee for Aeronautics, Washington, D. C.
IDEALIZED WINGS AND WING-BODIES AT A MACH NUMBER OF 3, by Elliott D. Katzen. July 58, 11p.

Order as TN 4361 from National Aeronautical and Space Administration, 1520 H St., N. W., Washington 25, D. C.

Calculations indicate the possiblity of obtaining high lift-dray ratios at a Mach number of 3, and some experiments which were designed to exploit the theory are described. The relatively high lift-drag ratios calculated were partly realized. A trimmed lift-dray ratio of 9 was obtained, instead of the estimated value of 11, at the maximum test Reynolds number of 3.5 million (based on wing aerodynamic chord).

National Advisory Committee for Aeronautics, Washington, D. C.
LOW-SPEED EXPERIMENTAL DETERMINATION OF THE EFFECTS OF LEADING-EDGE RADIUS AND PROFILE THICKNESS ON STATIC AND OSCILLATORY LATERAL STABILITY DERIVATIVES FOR A DELTA WING WITH 60° OF LEADING EDGE SWEEP, by Herman S. Fletchcer. July 58, 45p.
Order as TN 4341 from National Aeronautical and Space Administration, 1520 H St., N. W., Washington 25, D. C.

Six delta-wing models with 60° of leading-edge sweep were oscillated about their vertical axes to determine the effects of systematic variation of leading-edge radius and profile thickness on the in-phase and out-of-phase combination lateral stability derivatives resulting from the motion. The results showed that, in general, increasing the leading-edge radius caused noticeable decreases in all the derivatives and increasing the airfoil thickness reduces the effective-dihedral parameter.

National Advisory Committee for Aeronautics, Washington, D. C.
LOW TIP MACH NUMBER STALL CHARACTERISTICS AND HIGH TIP MACH NUMBER COMPRESSIBILITY EFFECTS ON A HELICOPTER ROTOR HAVING AN NACA 0009 TIP AIRFOIL SECTION, by Robert D. Powell, Jr. and Paul J. Carpenter. July 58, 28p.
Order as TN 4355 from National Aeronautical and Space Administration, 1520 H St., N. W. Washington 25, D. C.

An investigation has been conducted on the Langely helicopter test tower to determine experimentally the low tip Mach number maximum mean lift coefficient and high tip Mach number mean lift compressibility effects on a helicopter rotor having an NACA 0009 air foil tip section, an NACA 0017 airfoil tip section, and 5.4° of negative twist. Data, presented for blade-tip Mach numbers ranging from 0.28 to 0.72 (corresponding blade-tip Reynolds number range of 1.65×10^6 to 4.29×10^6), have been compared with two-dimensional data as well as with other rotor experimental data.

National Advisory Committee for Aeronautics, Washington, D. C.
MEASUREMENTS OF THE NONLINEAR VARIATION WITH TEMPERATURE OF HEAT-TRANSFER RATE FROM HOT WIRES IN TRANSONIC AND SUPERSONIC FLOW, by Warren Winovich and Howard A. Stine. Apr 57, 33p.
Order as TN 3965 from National Aeronautical and Space Administration, 1520 H. St., N. W., Washington 25, D. C.

An experimental investigation was undertaken to determine heat-loss characteristics of hot wires operating at Mach numbers between 0.5 and 2.5. At constant temperature potential, the Nusselt number is given as a function of the Reynolds number and Mach number. The influence of Mach number on nonlinearity between temperature and heat-transfer rate was determined at various Reynolds numbers.

National Advisory Committee for Aeronautics, Washington, D. C.
METHOD FOR THE CALCULATION OF THE LATERAL RESPONSE OF AIRPLANES TO RANDOM TURBULENCE, by John M. Eggleston and William H. Phillips. Feb 58, 34p.
Order as TN 4196 from National Aeronautical and Space Administration, 1520 H St., N. W. Washington 25, D. C.

In this method, the gust velocities are represented as rolling gusts, yawing gusts, and side gusts. Random distributions of gust velocities across the span are taken into account in defining the rolling and yawing gusts. Complex stability derivatives are used to account for the random distribution of side gusts along the fuselage and vertical tail and the lag effects in gust penetration. A sample calculation procedure is presented for obtaining the response of the airplane in each degree of freedom.

National Advisory Committee for Aeronautics, Washington, D. C.
NOTE ON THE EFFECT OF HEAT TRANSFER ON PEAK PRESSURE RISE ASSOCIATED WITH SEPARATION OF TURBULENT BOUNDARY LAYER ON A BODY OF REVOLUTION (NACA RM-10) AT A MACH NUMBER OF 1.61, by Kazimieri Roman Czarnecki and Archibald R. Sinclair. Apr 57, 11p.
Order as TN 3997 from Nationa Aeronautical and Space Administration, 1520 H. St., N. W. Washington 25, D. C.

The effects of heat transfer on the peak pressure rise associated with the separation of a turbulent boundary layer on a body of revolution (NACA RM-10) at a Mach number of 1.61 have been determined experimentally. Tests were made over a Reynolds number range, based on the distance from model nose to separation point, from 11.6×10^6 to 34.8×10^6 for a ratio of model-wall temperature to stagnation temperature of 0.96 (zero heat transfer) to 0.75. The results indicate little or no effect of heat transfer on the peak pressure

rise for separation. The technique of using shock angles to determine the peak pressure rise for separation gave results that were in fairly good agreement with those obtained in previous investigations by means of measured pressures.

National Advisory Committee for Aeronautics, Washington, D. C.
PRESSURE DISTRIBUTIONS AT TRANSONIC SPEEDS FOR SLENDER BODIES HAVING VARIOUS AXIAL LOCATIONS OF MAXIMUM DIAMETER, by John B. McDevitt and Robert A. Taylor. July 58, 112p.
Order as TN 4380 from National Aeronautical and Space Administration, 1520 H St., N. W., Washington 25, D. C.

The measured static-pressure distributions at the model surface and in the surrounding flow field are presented for a related series of five bodies of revolution having various axial locations of maximum cross-sectional area. The bodies were tested at zero angle of attack through a Mach number range from 0.80 to 1.20.

National Advisory Committee for Aeronautics, Washington, D. C.
SHAPE OF INITIAL PORTION OF BOUNDARY OF SUPERSONIC AXISYMMETRIC FREE JETS AT LARGE JET PRESSURE RATIOS, by Eugene S. Love and Louise P. Lee. Jan 58, 29p.
Order as TN 4195 from National Aeronautical and Space Administration, 1520 H St., N. W. Washington 25, D. C.

Calculations have been made of the initial portion of the boundary of axisymmetric free jets exhausting at large pressure ratios from a conically divergent nozzle having a jet exit Mach number of 2.5 and a semidivergence angle of 15°. The results of the calculations indicate the size and shape of the jet to be expected at large pressure ratios, the effects of ratio of specific heats, and the large initial inclinations of the boundary that are likely to be encountered by hypersonic vehicles at high altitude.

National Advisory Committee for Aeronautics, Washington, D. C.
STATISTICAL STUDY OF TURBULENCE. SPECTRAL FUNCTION AND CORRELATION COEFFICIENTS (ETUDE STATISTIQUE DE LA TURBULENCE. FONCTIONS SPECTRALES ET COEFFICIENT DE CORRELATION) by Francois N. Frenkiel. June 58, 116p.
Order as TN 1436 from National Aeronautical and Space Administration, 1520 H St., N. W., Washington 25, D. C.

Translated by Mary L. Mahler from France. Office National d'Etudes et de Recherches Aeronautiques, Rapport technique no. 34, 1948.

An extensive discussion is given of various possible correlation functions for homogeneous and isotropic turbulence. The logical consequence of each of several choices of such correlation functions is examined in detail.

National Advisory Committee for Aeronautics, Washington, D. C.
WIND-TUNNEL INVESTIGATION OF THE STATIC LONGITUDINAL STABILITY AND TRIM CHARACTERISTICS OF A SWEPTBACK-WING JET-TRANSPORT MODEL EQUIPPED WITH AN EXTERNAL-FLOW JET-AUGMENTED FLAP, by Joseph L. Johnson, Jr. Jan 58, 89p.
Order as TN 4177 from National Aeronautical and Space Administration, 1520 H. St., N. W., Washington 25, D. C.

The investigation included tests of the model to determine the effects of wing position, vertical position of the horizontal tail, and size of the horizontal tail for a range of momentum coefficients up to about 4. The model had a 30° sweptback wing with an aspect ratio of 6.60. Calculations were made to compare the relative merits of various trim devices for use on airplanes equipped with jet-augmented flaps.

Hydrodynamics, Hydraulics, and Hydrostatics

California Inst. of Tech., Pasadena.
HYDRODYNAMICS OF SPHERICAL CAVITIES IN THE NEIGHBORHOOD OF A RIGID PLANE, by Joseph M. Green. July 57, 57p. Contract Nonr-220(28); Technical rept. no. 85-1.
Order from LC mi $3.60, ph $9.30 PB 134 722

The velocity potential in a perfect fluid is found for a sphere which is translating in a direction normal to a rigid plane and which is simultaneously undergoing a change in its radius. The solution of the problem is conveniently pursued in the bispherical coordinate system. The kinetic energy of the fluid is determined.

David W. Taylor Model Basin, Washington, D. C.
EFFECT OF PROPELLER PITCH CHANGES ON TORQUE UNBALANCE OF COUNTERROTATING PROPELLERS, by W. B. Morgan. Mar 57, 7p. Rept. no. 1124.
Order from LC mi $1.80, ph $1.80 PB 133 815

Theoretical calculations are made to show the effect of a small change in propeller pitch on the torque unbalance of a pair of counterrotating propellers. From the calculations it can be estimated that a one percent pitch change on one propeller of a counterrotating pair will cause a change of approximately 8 percent in torque of that propeller. The exact effect on torque of a pitch change is dependent on the propeller loading and on whether the forward or after propeller pitch is changed.

Hydrodynamics Lab., Calif. Inst. of Tech., Pasadena.
WATER TUNNEL EXPERIMENTS ON SPHERES IN CAVITY FLOW, by En-Yun Hsu and Byrne Perry. Apr 54, 5p. Contract N6onr-244(24); Rept. no. E-24.9 AD-42327.
Order from LC mi $1.80, ph $1.80 PB 134 422

Institute of Engineering Research, U. of Calif., Berkeley.
SHIP RESISTANCE IN UNIFORM WAVES AS A FUNCTION OF WAVE STEEPNESS, by O. J. Sibul and G. Reichert. June 57, 37p. Contract Nonr-222(18): Series 61, Issue 14.
Order from LC mi $3.00, ph $6.30 PB 134 286

Page 13 may not reproduce well.

The resistance of the ship in still water was measured in separate experiments so that the added resistance due to the oncoming waves could be computed. The results indicate that the added resistance coefficient depends upon the Froude number and the steepness of the waves. The lower the Froude number the higher the added resistance coefficient.

Johns Hopkins U., Baltimore, Md.
SOME PROBLEMS CONNECTED WITH THE MOTION OF SMALL PARTICLES IN TURBULENT FLUID, by John Leask Lumley. Thesis, June 57, 119p. Contract Nonr-248(38).
Order from LC mi $6.00, ph $18.30 PB 134 960

The equation of motion for a particle in turbulent fluid is reduced to an integral equation similar to that for the position of a fluid point (a point attached to the moving continuum), but containing an analytically specified weighting function. When this function is identically unity, the equation reduces to the equation for a fluid point. The problem of the solution of this equation as a stochastic nonlinear integral equation is formulated, and the question of sufficient information is discussed.

National Advisory Committee for Aeronautics, Washington, D. C.
COMPARISON OF HYDRODYNAMIC-IMPACT ACCELERATION AND RESPONSE FOR SYSTEMS WITH SINGLE AND WITH MULTIPLE ELASTIC MODES, by Robert W. Miller. Feb 58, 30p.
Order as TN 4194 from National Aeronautical and Space Administration, 1520 H St., N. W. Washington 25, D. C.

Hydrodynamic-impact tests were made on a multimode elastic model consisting of a rigid prismatic float and a flexible wing. Comparisons of multimode results with theoretical and experimental results for a single-mode system having the same mass ratio indicated that the applied accelerations are in agreement with those obtained by the method of NACA Report 1074 and that the higher modes present has no significant effect on the applied accelerations.

National Advisory Committee for Aeronautics, Washington, D. C.
EFFECTS OF NOSE SHAPE AND SPRAY CONTROL STRIPS ON EMERGENCE AND PLANING SPRAY OF HYDRO-SKI MODELS, by John R. McGehee. July 58, 28p.
Order as TN 4294 from National Advisory Committee for Aeronautics, 1512 H Street, N. W. Washington 25, D. C.

National Advisory Committee for Aeronautics, Washington, D. C.
HYDRODYNAMIC IMPACT LOADS OF A -20° DEAD-RISE INVERTED-V MODEL AND COMPARISONS WITH LOADS OF A FLAT-BOTTOM MODEL, by Philip M. Edge, Jr. Aug 58, 36p.
Order as TN 4339 from National Aeronautical and Space Administration, 1520 H St., N. W., Washington 25, D. C.

Hydrodynamic-impact-loads data were obtained at the Langley impact basin from tests of a narrow-beam model. Fixed-trim impacts were made in smooth water over a range of landing conditions at a beam-loading coefficient of 19.15, with a few impacts at beam-loading coefficients of 27.90 and 36.07. Loads, moments, motions, and bottom pressures were measured throughout each of the impacts. The maximum impact loads for the inverted-V model are compared with loads obtained for a flat-bottom model.

Rensselaer Polytechnic Inst., Troy, N. Y.
ANALYSIS OF TWO FLOW FIELDS IN NONDISSIPATIVE INTERACTION, by Vural Oskay. Jan 58, 36p. Contract AF 18(603)37; TR AE 5711.
Order from LC mi $3.00, ph $6.30 PB 134 423

Two methods of analysis are developed for the study of the interaction of two non-viscous, incompressible fluids in an energy exchange mechanism proposed by Foa.

Statics, Kinematics, and Kinetics

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
FORCES DEVELOPED ON A CAR TRAVELING RADIALLY ALONG A MOVING CENTRIFUGE ARM, by Richard J. Crosbie. Sep 56, 19p. Proj. NM 001 100 303, rept. no. 5; NADC-MA-5610.
Order from LC mi $2.40, ph $3.30.

Equations are derived which enable one to determine the forces acting on a car traveling radially along a moving centrifuge arm. These forces are of interest in determining the feasibility of attaching a track to a centrifuge arm which will provide a device for producing either a step or an impulse forcing function.

Brown U. Div. of Applied Mathematics, Providence, R.I.

WAVE PROPAGATION IN RING SPRINGS UNDER GENERAL LOADING, by Kenneth L. Miller. Apr 58, 77p. Contract DA 19-020-ORD-798; Rept. no. DA-798/33.

Order from LC mi $4.50, ph $12.30 PB 135 138

This investigation studies the propagation of waves in an initially stressed ring spring which is rigidly fixed at one end and subjected to a transient compressive force at the other. This variable load is required only to be continuous with a single maximum within the loading interval; possible discontinuities are allowed in the load at the ends of this interval, however. The solution is obtained by formally replacing the spring by an equivalent uniform, continuous rod of material with a stress-strain curve corresponding to the load deflection relation for the spring and then applying the continuum theory of stress wave propagation.

Engineering Research Inst., U. of Michigan, Ann Arbor.

COMPRESSIBLE ELASTIC-PLASTIC WEDGE, by D.R. Bland and P.M. Naghdi. Feb 57, 9p. Contract Nonr-1224(01); Technical rept. no. 8; Rept. no. 2150-8-T.

Order from LC mi $1.80, ph $1.80 PB 133 547

This paper is concerned with a compressible elastic-plastic wedge of an included angle in the state of plane strain. The solution, deduced for an isotropic non-work hardening material, employs Tresca's yield criterion and the associated flow rules. By means of a numerical example the solution is compared with that of an incompressible elastic-plastic wedge in one case for various position of the elastic-plastic boundary.

Engineering Research Inst., U. of Michigan, Ann Arbor.

ON PLANE STRESS SOLUTION OF AN ELASTIC-PERFECTLY PLASTIC WEDGE, by P.M. Naghdi. May 57, 11p. Contract Nonr-1224(01); Technical rept. no. 10; Rept. no. 2150-10-T.

Order from LC mi $2.40, ph $3.30 PB 133 823

With the use of Tresca's yield function and its associated flow laws, the complete solution is obtained for an isotropic, elastic-perfectly plastic wedge (with an included angle subjected to a uniform traction in the state of plane stress). Unlike its corresponding plane strain solution, the state of stress is a portion of the plastic domain of the wedge is at a corner of Tresca's yield hexagon where, in general, the normal to the yield surface is not uniquely defined.

Engineering Research Inst., U. of Michigan, Ann Arbor.

PROPAGATION OF NON-AXIALLY SYMMETRIC WAVES IN ELASTIC CYLINDRICAL SHELLS, by R.M. Cooper and P.M. Naghdi. Apr 57, 16p.

Contract Nonr-1224(01); Technical rept. no. 9; Rept. no. 2150-9-T.

Order from LC mi $2.40, ph $3.30 PB 133 824

This paper is concerned with the predictions of phase velocities and amplitude ratios, for non-axially symmetric wave propagation in an elastic cylindrical shell, by employing two systems of equations of motion; these two systems of equations were previously employed in a similar study but limited to torsionless axisymmetric wave propagation. Comparison is again made between the predictions of the two systems of equations including the case of purely torsional motion.

Purdue U. Div. of Engineering Sciences, Lafayette, Ind.

RESPONSE OF A SIMPLY SUPPORTED TIMOSHENKO BEAM TO A PURELY RANDOM BAUSSIAN PROCESS, by J. Clifton Samuels and A. Cemal Eringen. June 57, 26p. Contract Nonr-1100(02); Technical rept. no. 10.

Order from LC mi $2.70, ph $4.80 PB 134 396

Generalized Fourier analysis is applied to the damped Timoshenko beam equation to calculate the mean square values of displacements and bending stress, resulting from purely random loading. Compared with the calculations based on the classical beam theory, it was found that the displacement correlations of both theories were in excellent agreement.

METALLURGY

Ferrous Metals

Curtiss-Wright Corp., Caldwell, N. J.
RESEARCH ON FERROUS MATERIALS FATIGUE, by Harold N. Cummings, Foster B. Stulen, and William C. Schulte. Rept. for 1 May 57-30 Apr 58. Aug 58, 115p. Contract AF 33(616)5182; WADC TR 58-43; AD-155 772.
Order from OTS $2.50 PB 151 243

Three studies of the effect of fatigue stressing on steel R. R. Moore rotating beam specimens were made, - (1) the rate of propagation of fatigue cracks, (2) the effect on fatigue strength of surface hardening by shot peening and plating, by carburizing, and nitriding, and (3) the transverse properties of SAE 4340 steel. An equation is proposed expressing fatigue crack length as a function of fatigue life. The increased strength produced by surface hardening is indicated and certain limitations on the use of Prot method testing are incidentally brought to light and discussed. Some decrease in transverse strength as compared with longitudinal strength is revealed and discussed for rolled and forged SAE 4340 steel.

Industrial Test Lab. Philadelphia Naval Shipyard, Pa.
EFFECT OF HALIDE ADDITION TO THE SULFURIC ACID PICKLING BATH, by M. Haftel and W. L. Reichel. Feb 57, 30p. ITL test no. 2896.
Order from OTS 75 cents PB 131 794

The effect of sodium halide addition in the range of 0.1 to 1 percent to inhibited sulfuric acid pickling baths for mild steel and special treatment steel has been investigated.

National Advisory Committee for Aeronautics, Washington, D. C.
COMPRESSIVE STRENGTH AND CREEP OF 17-7 PH STAINLESS-STEEL PLATES AT ELEVATED TEMPERATURES, by Bland A. Stein. July 58, 33p.
Order as TN 4296 from National Aeronautical and Space Administration, 1520 H St., N. W. Washington 25, D. C.

Compressive strength test results from room temperature to 1,000° F and compressive creep test results from 7000°F are presented for plates of 17-7 PH stainless steel, Condition TH 1,050, which were edge-supported in V-groove fixtures. Plate width-thickness ratios range from 15 to 60. Master curves are presented which show the combinations of average stress, temperature, and time which produce given amounts of creep strain or failure of the plates and which facilitate interpolation of the test results. The test results are compared with plate strengths and creep failure stresses determined from semiempirical approximations.

Pennsylvania State [U. Coll.] of Mineral Industries [University Park]
INVESTIGATION INTO EFFECTS OF CARBON AND NITROGEN ON TEMPER BRITTLENESS IN STEELS, by K. J. Stodden and Jay W. Fredrickson. Rept. on Proj. TB 4-1, Fracture Characteristics of Metals, Nov 49, 76p. Contract W36-061-ORD-2903, WAL 310/110-16.
Order from LC Mi $4.50, ph $12.30 PB 134 984

Brittle failure in tension was not obtained for wire specimens having a tempered martensitic microstructure even when subjected to temper embrittlement and testing at a temperature of -190 C. Wire tensile specimens having a tempered martensitic microstructure were notched circumferentially and tested in tension at temperatures varying from room temperature to -190 C. A plot of reduction of area at the base of the notch versus testing temperature revealed a transition from high ductility at the higher testing temperatures to lower ductility at reduced temperatures.

Light Metals

Armour Research Foundation, Chicago, Ill.
STUDIES OF PHASE RELATIONSHIPS AND TRANSFORMATION PROCESSES OF TITANIUM-ALLOY SYSTEMS, by Donald J. McPherson and William Rostoker. Summary rept. 8 Jan 53-8 Jan 54. Oct 54, 132p. Contract AF 33(038)8708; WADC TR 54-1-1; AD 56 084.
Order from LC Mi $6.90, ph $21.30 PB 135 195

Time-temperature-transformation charts were determined for ternary Ti-base alloys of Al-Mo, Al-Fe, Al-Mn and Al-Cr. Aging studies of the Ti-rich corner of the Ti-Mo-V system showed that none of the alloys were permanently B stable. The phase relationships in the Ti-rich corner of the Ti-Al-V system were investigated for elevated temperature applications. The Ti-rich corner of the Ti-Al-Si system was investigated for the solubility of Si in the a and B fields. Phase relationships in the Ti-rich corner of the Ti-Al-Si system were studied, and isothermal and vertical sections were compiled. Age hardening and solubility tests on Si, C. B. and Be in base compositions of Ti-4% V, Ti-3% Mo, and Ti-2% Cr were performed; 9 partial vertical sections were compiled. Estimating the relative proportions of a and B by integrated X-ray diffraction line intensities was found unsuitable in Ti alloys. Diffraction examination of quenched binary alloys containing Ti-7% Mo and Ti-9% Mo showed 2 separate martensities. Study of Ti-5% Al and Ti-9% Ta indicated that the transformation products of quenching were not martensitic. Observations of tempering a needles in Ti- Mo binary alloys demonstrated that 2 mechanisms existed: (1) development of a duplex structure possessing a

midrib (B) and 2 side bands (a), and (2) the finely dispersed precipitate (a) within the needle.

Columbia U. New York, N. Y.
EXPLORATORY CREEP RUPTURE OF ALUMINUM ALLOYS OF ELEVATED TEMPERATURE, by O. W. Dillon. Technical rept. no. 1, Mar 57. 24p. Contract Nonr-26634; CU-1-57-onr-266(34).
Order from LC mi $2.70, ph $4.80 PB 133 332

An exploratory investigation of the notch effects in creep-rupture tests has been conducted on commercially pure aluminum and on a structural alloy. 34 creep-rupture tests on 2 S-0 and 18 such tests on 24ST-4 aluminum alloys were completed. One notched test specimen had a high and another a low elastic stress concentration factor. The notched specimens exhibited strengthening which could be correlated with the plain specimen results for the specimen with the low elastic stress concentration factor. The effects of the plasticity modified this procedure when the specimen contained a notch producing a high concentration factor. Test temperatures were from 100° to 700°F.

Dow Chemical Co., Midland, Mich.
EXPERIMENTAL MAGNESIUM ALLOYS. PART 4: EVALUATION OF HK31, by H. A. Johnson. June 54, 17p. Contract AF 33(600) 19147. WADC TR 54-83, pt. 4; AD-45830
Order from LC mi $2.40, ph $3.30 PB 135340

Includes testing and evaluation of production rolled HK31XA sheet. The results are preliminary but indicated that the good combination of room and elevated temperature properties can be produced under plant-scale rolling conditions. (See also PB 130 394-130 395, 130 409, 130 954)

Dow Chemical Co., Midland, Mich.
INVESTIGATION OF ALLOYS OF MAGNESIUM AND THEIR PROPERTIES. PART 1: IMPROVED Mg WROUGHT ALLOYS, by J. D. Wood. Rept. for Feb 54-Feb 55, Oct 55; 61p. Contract AF 33(616) 2337; WADC TR 55-160, pt. 1: AD 90583.
Order from LC mi $3.90, ph $10.80 PB 135 202

A Mg sheet alloy containing 4-5% Zn, 1-2% MM, and 1-2% Mn with an excellent combination of workability, strength and ductility was developed. A typical yield strength of 35,000 psi or higher should be realized through proper fabrication of these alloys. High strength sheet can also be obtained by work hardening Mg-Ag-Zn-Zr alloys such as QZ66 and QZ63. (See also PB 135 201)

Dow Chemical Co., Midland Mich.
INVESTIGATION OF ALLOYS OF MAGNESIUM AND THEIR PROPERTIES. PART 2: PHYSICAL PROPERTIES OF Mg BASE ALLOYS, ed by J. D. Wood. Feb 54-Feb 55. Oct 55, 28p. Contract AF 33(616)-2337; WADC TR 55-160, pt. 2; AD 90584.
Order from LC mi $2.70, ph $4.80 PB 134 201

The coefficients of linear thermal expansion have been determined for pure magnesium, AZ31A, AZ31B, AZ63A, AZ81XA, ingot extruded ZK60A, pellet extruded ZK60A, EK30A, EK41A, EZ33A, HK31XA, and HZ32XA using a high precision dilatometer. The electrical conductivities of AZ31A, AZ31B, AZ63A, AZ92A, cast ZK60A, and pellet extruded ZK60A have been determined using a Kelvin Bridge. Values obtained compare favorably with previous determinations. Thermal conductivities of the alloys were calculted from the electrical conductivity data using the Powell and Bungardt equations. The heat capacity and heat fusion of pure magnesium are also reported. (See also PB 135 202)

Materials Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
METALLURGICAL INVESTIGATION OF ALUMINUM ALLOY X2219-T6, by Paul L. Hendricks. Rept. for Nov 56-Dec 57. June 58, 28p. WADC TN 58-57; AD-155 672.
Order from OTS 75 cents PB 151 235

This investigation was undertaken to determine some design properties of aluminum alloy X2219-T6 at room and elevated temperatures. This investigation included the determination of tensile properties, fatigue properties, stress rupture properties and stress corrosion characteristics of aluminum alloy X2219-T6 under various temperature conditions up to 600°F.

Naval Engineering Experiment Station, Annapolis, Md.
BASIC INFORMATION ON THE BEARING PROPERTIES OF VARIOUS MATERIALS IN LIQUID METALS, by M. R. Gross and W. J. Greenert. Feb 52, 37p. EES 9c(3)966861.
Order from LC mi $3.00, ph $6.30 PB 130 906

Sliding contact tests in NaK up to and including 500°F continue to show a superiority for aluminum base alloys. The materials tested in the hot hardness tester showed little or no change in room temperature and hot hardness after 5000 hours in NaK at 750°F.

Battelle Memorial Inst. Titanium Metallurgical Lab. Columbus, Ohio.
FEASIBLITY OF USING MOLTEN METALS FOR SOLUTION HEAT TREATMENT OF TITANIUM SHEET ALLOYS, by D. J. Maykuth and E. S. Bartlett. Dec 57, 14p.
Order from LC mi $2.40, ph $3.30 PB 134 397

This memorandum summarizes a literature survey on the reactions of titanium with molten metals and the results of a brief laboratory program investigating the feasibility of using molten metals for the solution heat treatment of titanium sheet alloys.

Watertown Arsenal Labs., Mass.
EFFECT OF REDUCTION AND TEMPERATURE UPON ROLLING LOAD, SPREAD, AND FORWARD SLIP IN THE HOT ROLLING OF TITANIUM AND TITANIUM ALLOYS, by F. R. Larson and J. Nunes. Mar 58, 99p. WAL TR 401/294.
Order from LC mi $5.40, ph $15.30 PB 134 961

An experimental study was conducted of the hot rolling characteristics of four titanium base materials and, for comparison, a mild steel. (The titanium alloys, Ti-75A, RC-130A, Ti-6Al-4V, and RC-130B, were rolled at two speeds of 30 and 195 surface feet per minute, at rolling temperature of 1000 to 2000°F, and reductions ranging from approximately 10 to 50%. Measurements were made of the rolling load, lateral spread, and forward slip. A limited study of the specimen width effects with Ti75A was also made. It was found that the rolling load, specific pressure, lateral spread, and forward slip increase with reduction. The increases in rolling load with reduction were most pronounced in the low temperature range.

Nonferrous (except light) Metals

Illinois U., Urbana.
MARTENSITIC TRANSFORMATIONS AND DETERMINATION OF THE INHOMOGENEOUS DEFORMATION, by David S. Lieberman. Mar 58, 47p. Contract AF 18(600)1311; MEDUI-21-AF; AFOSR TN 58-76; AD 148 124.
Order from LC mi $3.30, ph $7.80 PB 134 307

A simple graphical method is presented for determining directly from observations of the crystallographic features of a martensitic transformation the inhomogeneous deformation which is part of the total transformation distortion.

Metals Research Lab., Carnegie Inst. of Tech. Pittsburgh, Pa.
PHASE TRANSFORMATIONS IN HYPOEUTECTOID TITANIUM-CHROMIUM ALLOYS, by Hubert I. Aaronson, George M. Andes and others. Rept. for 1 Aug 55-31 July 56. Dec 56, 34p. Contract AF 33(616)3148; WADC TR 56-469; AD-110682.
Order from LC mi $3.00, ph $6.30 PB 135 222

The morphologies of proeutectoid alpha in a titanium-chromium alloy have been investigated in some detail and found to be quite similar to those previously observed in the proeutectoid ferrite reaction in plain carbon steels. The most important difference in the two reactions lies in the much smaller amount of under-cooling required in the proeutectoid alpha reaction in order to develop plates and sheaves of plates. The eutectoid reaction in hypoeutectoid titanium-chromium alloys was found to consist primarily in the precipitation of alpha and $TiCr_2$ from beta.

Northrop Aircraft, Inc., Hawthorne, Calif.
STABILITY OF TUNGSTEN IN HYDROGEN AT ELEVATED TEMPERATURES IN THE PROGRAM ON THE STABILITY OF REFRACTORY ELEMENTS AND COMPOUNDS IN A HYDROGEN ATMOSPHERE AT ELEVATED TEMPERATURES, by L. A. Ohlinger. Sep 48, declassified 25 Nov 57. 21p. NRR-165; NOR-56 NEPA-767; AD-146562.
Order from LC mi $2.70, ph $4.80 PB 135 666

Office of Naval Research, Washington, D. C.
SYMPOSIUM, TECHNOLOGY OF MOLYBDENUM AND ITS ALLOYS, HELD AT RACKHAM MEMORIAL BUILDING, ENGINEERING SOCIETY OF DETROIT, 18-19 Sep 1956. Oct 56, 21p. ONR ACR-12.
Order from OTS 75 cents PB 131 793

Contains abstracts of papers delivered at this symposium, dealing with: molybdenum as a structural materials, preparation and fabrication of molybdenum and its alloys, European developments of molybdenum metallurgy of molybdenum and molybdenum-base alloys, and molybdenum alloys for gas turbine applications.

Sintercast Corp. of America, Yonkers, N. Y.
RESEARCH ON HEAT RESISTANT ALLOYS STRENGTHENED AT ELEVATED TEMPERATURES BY INCORPORATION OF FINE PARTICULATE SUBSTANCES, by Eric Gregory and Martin Epner. Summary rept. Dec 56, 29p. Contract Noa(s) 56-227-c; AD-127 156.
Order from OTS $1.00 PB 131 846

A technique has been established for the production of materials of high density consisting of an 80-20 nickel-chromium alloy matrix containing uniform dispersions of hard phase addition agents. Preliminary investigations have been made of different blending techniques which can be employed in the preparation of the mixtures. Materials have also been produced from composite powders made by chemical deposition of nickel on a blend of chromium and the hard phase addition agent inpulverulent form.

Structural Metallurgy and Corrosion

Ballistic Research Labs., Aberdeen Proving Ground, Md.
EXPERIMENTS ON THE EROSION OF STEEL BY PROPELLANT GASES USING THE VENT TECHNIQUE, by R. N. Jones and E. R. Weiner. Mar 57, 41p. Rept. no. 1012.
Order from LC mi $3.30, ph $7.80 PB 134 285

A brief discussion is presented of the general field of the application of the vent erosion technique to the problem of the erosion of steel by propellant gases. The development of this technique is given

together with a presentation of the more significant results.

California U., Los Angeles.
POLYAXIAL INELASTIC STRESS-STRAIN RELATIONSHIP OF FACE-CENTERED CUBIC METALS, by T. H. Lin. Jan 58, 21p. Contract AF 49(638)20; AFOSR TN-58-151; AD-152 177.
Order from LC mi $2.70, ph $4.80 PB 134 577

This report gives further development of the plasticity theory based on slips (see AF OSR TR 56-31, PB 124 110). Basic assumptions used in the slip polyaxial stress-strain relations of Batdorf and Budiansky are compared to those assumptions in the slip stress-strain relations proposed by the writer.

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
INVESTIGATION OF VARIOUS METAL PROTECTIVE COATINGS ON THE GUM FORMATION AND OXIDATION STABILITY OF GASOLINE, by V. O. Hatch. June 57, 36p. CCL rept. no. 28; AD-137784.
Order from OTS $1.00 PB 131 738

The effects of coating materials on gasoline gum formation and oxidation stability of the gasoline was investigated, as was the corrosion protection afforded by the coatings to steel. Forty six coatings, including five commercial coatings, were evaluated for the protection afforded steel in the presence of gasoline and moisture at a temperature of 150°F for a maximum of 500 hours. Data is presented in tabulated form for a great many tests. Some butadieneacrylonitrile copolymers and phenolic resins were suggested for field testing.

Columbia U., New York.
ON THE ANALYSIS OF NON-LINEAR VISCOELASTIC STRUCTURES WITH TEMPERATURE GRADIENTS, by H. H. Bleich. June 57, 26p. Contract Nonr-266(34); Technical rept. no. 3; CU-3-57-onr-266(34).
Order from LC mi $2.70, ph $4.80 PB 134 534

Martin Co., Baltimore, Md.
DEVELOPMENT OF BRAZED SANDWICH CONSTRUCTION MATERIALS FOR HIGH TEMPERATURE APPLICATIONS, by Charles F. Burrows and F. J. Ragland, Jr. Rept. for 15 Feb 56-15 Aug 57. July 58, 115p. Contract AF 33(616)2602; WADC TR 55-463, pt. 2; AD 155 725.
Order from OTS $2.50 PB 151 272

An investigation was undertaken to study various base metal - braze alloy combinations for honeycomb sandwich structures that would have utility up to a maximum temperature of 1200°F. The base alloys, 17-7 PH, 422, A286, 19-9DL and 17-14 Cu Mo were evaluated with silver and nickel base brazing alloys to determine their compatibility and strength characteristics to develop an optimum sandwich combination. On the basis of brazing studies and structural tests, it was found that A 286 corrosion resistant steel brazed with a nickel-chromium-silicon-iron-boron alloy offered the optimum sandwich construction for operating temperatures of 1000° to 1200°F. Static flexure and edgewise compression data are given for all optimum base metal - braze alloy combination. S/N curves for flexural fatigue studies made at temperatures of 75°, 500°, and 1000°F are presented for the A 286 with Ni-Cr-Si-Fe-B optimum sandwich combination.

Martin Co., Baltimore, Md.
STRUCTURAL EVALUATION OF BERYLLIUM PRODUCED BY SEVERAL PROCESSES, by B. B. Muvdi. Rept. for 1 June 57-28 Feb 58. June 58, 75p. Contract AF 33(616)5180; WADC TR 58-162; AD-155 562.
Order from OTS $2.00 PB 151 263

Five different beryllium fabrication processes were thoroughly examined in order to determine the process that would yield beryllium plate or sheet with optimum characteristics. The results of metal-lographic examinations, texture analysis and mechanical tests indicated that cold compacting beryllium powder, followed by upsetting, yielded the optimum combination of uniaxial as well as biaxial properties. This process was favored because it resulted in comparatively good surface finish, was relatively simple and economical to perform. Tension and flexure tests indicated that beryllium fabricated by cold compacting and upsetting is capable of appreciable plastic deformation before fracture.

Minnesota U., Minneapolis.
EFFECT OF STATIC PRESTRAIN ON THE PROT-FATIGUE PROPERTIES OF UNNOTCHED AND NOTCHED MATERIALS AT ROOM AND ELEVATED TEMPERATURE, by F. H. Vitovec. Rept. for Jan 56-Dec 57. July 58, 68p. Contract AF 33(616)2803; WADC TR 58-214; AD-155 738.
Order from OTS $1.75 PB 151 280

A study was conducted on the effect of short time and creep prestrain on the fatigue properties of unnotched and notched specimens of the alloys 7075-T-6 extruded, 2024-T4 extruded, 16-25-6 hot-cold-worked, and S-816 solution treated and aged. Fatigue properties were determined using a Prot-type test with a single loading rate of 0.01 psi per cycle. The main factors influencing the Prot-failure stress were residual stresses, metallurgical reactions, and cracks produced by prestraining. Strain hardening and relaxation of residual stress appeared to be of secondary importance for the materials and range of testing variables investigated.

National Advisory Committee for Aeronautics, Washington, D. C.
HANDBOOK OF STRUCTURAL STABILITY. PART VI: STRENGTH OF STIFFENED CURVED PLATES AND SHELLS, by Herbert Becker. July 58, 85p.
Order as TN 3786 from National Aeronautical and Space Administration, 1520 H St., N. W., Washington 25, D. C.

A comprehensive review of failure of stiffened curved plates and shells is presented. Panel instability in stiffened curved plates and general instability of stiffened cylinders are discussed. The loadings considered for the plates are axial, shear, and the combination of the two. For the cylinders, bending, external pressure, torsion, transverse shear, and combinations of these loads are considered. When possible, test data and theory were correlated. (See also PB 128 303, 128 305, 128 876-128 878)

National Advisory Committee for Aeronautics, Washington, D. C.
TRANSGRANULAR AND INTERGRANULAR FRACTURE OF INGOT IRON DURING CREEP, by L. A. Shepard and W. H. Giedt. Aug 58, 26p.
Order as TN 4285 from National Aeronautical and Space Administration, 1520 H. St., N. W. Washington 25, D. C.

Creep tests were performed on ingot iron at temperatures from 700° to 1,350°F to find whether the amount of grain-boundary sliding determined the fracture mode (transgranular or intergranular). If the mode were thus determined, a critical stress rather than a critical temperature would be the criterion for intergranular fracturing. Transgranular fractures were obtained below 800°F and above 20,000 psi. At higher temperatures, all fractures were intergranular. Tests indicated that intergranular fracturing may occur without grain-boundary shearing in the lower temperature range. It was concluded that a vacancy-condensation mechanism is most probably responsible for high-temperature intergranular fracturing in ingot iron.

National Bureau of Standards, Washington, D. C.
OXIDATION OF EXPERIMENTAL ALLOYS, by Joseph C. Richmond and H. Richard Thornton. Rept. for 1 Mar 56-30 Nov 57. June 58, 54p. Contract AF 33(616)56-19; WADC TR 58-164, pt. 1; AD-155 688.
Order from OTS $1.50 PB 151 264

A study was made of the oxidation resistance of ten high=temperature alloys; 1) Aluminum modified Nichrome V, 2) Nichrome V, 3) niobium modified Nichrome V, 4) an iron-chromium-aluminum alloy, 5) Inconel 702, 6) Hastelloy R235, 7)Hastelloy W, 8)type 316 stainless steel, 9) Inconel X, and 10) Inconel. Tests inc the measurement of the average depth of external oxidation and maximum depth of oxide penetration on specimens that had been subjected to stress in air at high temperatures for 100 hours, and on specimens that had been subjected to stress in air under fluctuating-temperature conditions for an equivalent length of time, plus continuous recording of the weight change of specimens oxidized in air at high temperatures. All of the alloys conformed reasonably well to the parabolic rate law in the weight-gain oxidation tests.

Naval Engineering Experiment Station, Annapolis, Md.
SEA WATER CORROSION TEST OF ALUMINUM ALLOY PIPE, by J. L. Basil and M. W. Rausch. Feb 55, 12p. EES 040037A(5)
Order from LC mi $2.40, ph $3.30 PB 135 489

Reports on sea water corrosion tests of "1" IPS pipe of 3S Alclad, 3S, and 52S aluminum alloys at a velocity of 10 ft/sec for periods ranging from 12 to 42 months. Pitting rates indicated a life expectancy of at least 10 years for 3S and Alclad 3S under the conditions of test.

Northwestern Technological Inst., Evanston, Ill.
ACOUSTICAL STUDY OF LOW TEMPERATURE AGING IN Al-4.2% Cu, by M. E. Fine and Charles Chiou. Dec 57, 22p. Contract AF 18(600)1468; AFOSR TN 57-781; AD 148 013.
Order from LC mi $2.70, ph $4.80 PB 133 321

While Guinier-Preston zones are growing in Al-4.2% Cu at room temperature, Youngs modulus, measured dynamically, increases about 0.4%. From the change in modulus with time the exponent of time in the rate equation for growth of the zones was deduced to be 1/2. From a comparison of the rates of increase of modulus at 1, 28, and 42°C an activation energy of 12 to 14 K cal/mole is computed. These findings support the idea that Cu atoms are supplied along dislocation channels to growing zones.

Rensselaer Polytechnic Inst. Troy, N. Y.
ON ASPERITY DISTRIBUTIONS OF METALLIC SURFACES, by F. F. Ling. Jan 58, 33p. Contract AF 49(638)67. Technical note no. 1; AFOSR TN-58-77; AD-148125.
Order from LC mi $3.00, ph $6.30 PB 133 480

A chain of information is necessary to determine quantitatively the conglomerate properties of actual surfaces which are composed of many asperities. From the mechanical view point these informations fall into three categories: first, elasticity and/or plasticity concerning various shapes which approximate those of the actual asperities; second application of the above in sub-macroscopic sizes where Kick's law of similarity is not valid; and third, the manner in which these asperities are distributed. The last one is the least known among the three. This paper proposes a simple distribution.

Watertown Arsenal Lab., Mass.
ELEVATED TEMPERATURE CHARACTERISTICS OF INTERNALLY OXIDIZED TITANIUM-CERIUM ALLOYS, by Ralph H. Hiltz, Jr. Oct 57, 16p. WAL 401/284.
Order from OTS 50 cents PB 131 788

Solid solution titanium-cerium alloys, cold rolled to .010-inch thickness and annealed, were internally oxidized to produce a fine dispersion of CeO_2 in the titanium matrix. The oxidized alloys were cut into sheet stress-rupture specimens and tested for rupture life at 426°C, and 648°C. There was noted an improvement in strength over that of pure titanium; the internally oxidized alloys showed curves with a much flatter slope on the log stress-log rupture life plot, characteristic of the stable metal-metal oxide class of alloy.

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

Naval Research Lab., Washington, D. C.
SOME MEASUREMENTS OF THE RADIOACTIVITY OF THE AIR DURING 1957, by L. B. Lockhart, Jr., R. A. Baus, and R. L. Patterson, Jr. Oct 58, 35p. NRL 5208.
Order from OTS $1.00 PB 151 049

This report summarizes measurements made during 1957 on the concentrations of some natural radioactive materials and of gross fission products in the atmosphere at ground level. Among the topics covered are the daily or monthly variations of the concentrations of radon, thoron, and gross fission products in the air at several sites in the Northern Hemisphere, in Brazil, and in Antarctica. In addition, several measurements have been made of the contribution of Be^7 to the radioactivity of the atmosphere and of the relative concentration of RaD and RaF in the air at ground level at Washington, D. C., and Yokosuka, Japan. It is found that fission-product levels in the Northern Hemisphere are roughly tentimes as great as at similar latitudes in the Southern Hemisphere. However, the increase in the total radioactivity of the air is negligible when compared with the normal activity levels due to natural radon, thoron, and their decendents.

Elementary Particles

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
NUCLEAR PERIODS AND PROPERTIES, by S. Podgor. Aug 48, 9p. NEPA 698-STR-9; ATI-31639.
Order from LC mi $1.80, ph $1.80 PB 135 685

Texas Nuclear Corp., Austin.
INELASTIC SCATTERING OF FAST NEUTRONS FROM NITROGEN AND OXYGEN, by Norman A. Bostrom, Ira L. Morgan and others. Rept. for 31 Aug 56-28 Feb 58. 65p. Contract AF 33 (616)3817; WADC TR 58-88; AD-151 028.
Order from OTS $1.75 PB 151 244

An investigation of the inelastic scattering of neutrons from oxygen and nitrogen has been made in order to determine, when possible, inelastic neutron cross sections and gamma ray production cross sections. A single crystal NaI(Tl) spectrometer has been used to detect gamma rays from oxygen and nitrogen in the neutron energy ranges from 3.4 Mev to 5.05 Mev and from 14.9 Mev to 17 Mev. Cross sections for production of the 2.30 Mev gamma ray in N^{14} and the 6.1 Mev gamma ray O^{16} have been measured at several energies. An associated particle time-of-flight technique has been developed and used to measure the energy distribution of the neutrons inelastically scattered from oxygen at 14.9 Mev. A pulsed beam time-of-flight spectrometer has been constructed and tested and some preliminary results obtained. A detailed discussion of the time-of-flight apparatus is included in this report.

Instruments and Installations

Air Force Inst. of Tech. Dayton, Ohio.
INVESTIGATION OF CADMIUM SULFIDE AS A DETECTOR FOR MEASURING GAMMA BUILD-UP IN AN INFINITE GEOMETRY, by George Ralph Crane. Thesis. Mar 58, 58p. GNE [58]-7.
Order from LC mi $3.60, ph $9.30 PB 134 842

Highly-doped cadmium-sulfide crystals were found to give linear conductivity response with dose-rate from cobalt-60 gammas. Their gamma-sensitivity and rise-time characteristics were measured under variable temperatures, potential gradients, and dose-rates. The optimum operational conditions were defined for using the crystal as a build-up detector. Crystal output current was read by using a micro-ammeter in a simple dc circuit. Build-up values were determined for lead, iron, and aluminum for several irradiation configurations in spherical geometry. These values compared favorably with compared theoretical values, thus attesting the value of the detector.

Laboratory for Applied Biophysics, Mass. Inst. of Tech. Cambridge.
METHOD OF RADIATION DETECTION AND IMAGE INTENSIFICATION, by K. S. Lion and G. F. Vanderschmidt. Final rept. May 57, 95p. Contract Nonr-1841 (06); Technical rept. no. 5.
Order from OTS $2.25 PB 131 837

The image intensifier described in this report consists essentially of two layers. A light pattern is projected through a transparent electrode into the layer A. Layer A serves as a transducer.

United Kingdom Atomic Energy Authority. (Gt. Brit.).
RADIOACTIVE DECONTAMINATION PROCEDURES AND EQUIPMENT. Sep 57, 12p.
Order IGRL-IB/R-27 from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. 28 cents. S.O. code 91-10

Nuclear Engineering and Power

Air Force Inst. of Tech. Dayton, Ohio.
CONTAINMENT OF A NUCLEAR POWER EXCURSION IN THE AIR FORCE NUCLEAR ENGINEERING TEST REACTOR, by Donald Henry Asire. Thesis. Mar 58, 121p. GNE [58]-1
Order from LC mi $6.30, ph $19.80 PB 134 860

The AFNETR is a light-water moderated, cooled, and partially reflected heterogeneous reactor specifically designed for the test program in support of the Air Force nuclear propulsion program. Shock wave behavior in air, water, and solids is described at some length with special emphasis on the reflection, transmission, and reinforcement of shock waves at the various boundaries of interfaces encountered in the AFNETR. A missile capability analysis based on the Air Force Nuclear Engineering Test Facility design existing at present is made in several areas of concern that were pointed out by the model blast tests--concrete spallation, the core tank top plug, the thermal column outer door, test cell doors, and the water spray dome formed in the bulk shielding tank.

Massachusetts Inst. of Tech., Cambridge.
HEAT TRANSFER TO WATER FLOWING NORMAL TO CYLINDERS, by James N. Addoms and W. H. McAdams. Apr 48, 60p. NEPA 599-MIT-20; ATI-31 649
Order from LC mi $3.60, ph $9.30 PB 135 683

National Advisory Committee for Aeronautics, Washington , D. C.
TWO-DIMENSIONAL DIFFUSION THEORY ANALYSIS OF REACTIVITY EFFECTS OF A FUEL-PLATE-REMOVAL EXPERIMENT, by Edward R. Gotsky, James P. Cusick, and Donald Bogart. Jan 58, 30p.
Order as TN 4164 from National Aeronautical and Space Administration, 1520 H. St., N. W. Washington 25, D. C.

Effects of fuel plates successively withdrawn from the center fuel element of a seven- by three-core loading at the Oak Ridge Bulk Shielding Facility were evaluated by two-dimensional two-group diffusion calculations performed on the NACA reactor simulator. Two calculation methods were used: (1) The slowing-down properties of the experimental fuel element were represented by infinite media parameters; and (2) the finite size of the experimental fuel element was recognized, and the slowing-down properties of the surrounding core were attributed to this small region. Reasonable agreement existed between experimental and calculated effects.

Naval Ordnance Lab., White Oak, Md.
INVESTIGATION OF STRAIN-ENERGY ABSORPTION POTENTIAL AS THE CRITERION FOR DETERMINING OPTIMUM REACTOR-VESSEL CONTAINMENT DESIGN, by Walter R. Wise, Jr. June 58, 172p. NAVOR D 5748.
Order from OTS $3.00 PB 151 282

The purpose of the NOL reactor-vessel containment program is to provide information in determining optimum containment design. This purpose is achieved through an investigation of the structural response of model reactor vessels to internal simulated excursion-type loading. An analytic expression for plastic strain-energy absorption has been derived to implement the postulation that plastic strain-energy absorption potential is the basic containment-design criterion. Scaled reactor-vessel simulants have been hydrostatically and dynamically dilated, and analyses of the structural-response data are presented.

Nuclear Reactions

Cornell U. Ithaca, N. Y.
NUCLEAR MAGNETIC RESONANCE SATURATION AT INTERMEDIATE VALUES OF H_1, THE rf MAGNETIC FIELD, by D. F. Holcomb. Feb 57, 17p. Contract Nonr-401(15); Technical rept. no. 1.
Order from LC mi $2.40, ph $3.30 PB 133 326

Measurements have been made of the nuclear magnetic resonance absorption of the Li^7 spin system in metallic lithium for values of the rf magnetic field such that saturation is appreciable, but such that the rf field is small compared to the local fields. Measurements of line shape and amplitude were made at room temperature and at 77°K. At both temperatures, the line shape changes at the onset of saturation, although in different ways. Saturation measurements were also made on the proton resonance in water doped with $FeCl_3$, and it is found that in this case, in which $T_1 = T_2$, the line changes with saturation in a manner which agrees with solutions of the Bloch equations.

Pennsylvania U., Philadelphia.
STUDY OF (n, p) REACTIONS OF SEVERAL MIDDLE WEIGHT ELEMENTS, by Victor V. Verbinski. May 57, 41p. Contract Nonr-551(17); Technical rept. no. 2.
Order from LC mi $3.30, ph $7.80 PB 134 533

Energy and angular distributions are shown for (n, p) reactions on magnesium, nickel, copper, rhodium, and palladium.

Purdue U., Lafayette, Ind.
STATISTICAL DERIVATION OF NUCLEAR ROTATIONAL ENERGIES, by Kailash Kuman. 1958. 26p. Contract 18(600)1579; AFOSR TN 58-188
Order from LC mi $2.40, ph $3.30 PB 134 434

The nucleus is treated as a Fermi gas under the constraints of constant angular momentum and quadrupole moment. The deformation dependence of the nuclear moments of inertia is then derived on the basis of a model in which only the nucleons outside a certain spherical core produce all the angular momentum. The influence of the surface effects and the velocity dependent forces is also taken into account. Over-all agreement with the experimental data is obtained.

Texas U., Austin.
NUCLEAR MAGNETIC RESONANCE STUDY OF LIQUID CRYSTAL TRANSITIONS, by W. R. Runyan and A. W. Nolle. Thesis. Feb 57, 27p. Contract Nonr-375(05); Technical rept. no. 4.
Order from LC mi $2.70, ph $4.80 PB 132 654

The spin-lattice relaxation time (T_1) and the transverse relaxation time (T_2) are determined, by the spin-echo nuclear magnetic resonance method, for the isotropic-liquid state of the liquid-crystal compounds p-azoxyanisole (PAA), echolesteryl benzoate, cholesteryl n-butyrate, and cholesteryl propionate.

PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

Army Chemical Warfare Labs., Army Chemical Center, Md.
DEVELOPMENT OF GLOVE, PROTECTIVE, IMPERMEABLE, E18, by William Matfess and Milton Brill. Dec 57, 58p. CWLR 2204.
Order from LC mi $3.60, ph $9.30 PB 135 181

This report is a summary of work performed under contracts with Bond Rubber Corp., Derby Conn., covering the development of the M18 compression-molded butyl-rubber glove, to replace the standard M3 glove. Molds for three sizes of gloves were constructed, and used in the production of 1,000 pairs of each size. Quality level was about 80%.

PHYSICS

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge
WIDE-BAND HIGH-PRESSURE DIELECTRIC CELL, by M. G. Vallauri and P. W. Forsbergh, Jr. Oct 56. 9p. Technical rept. no. 111; Contract Nonr-1841.
Order from LC mi $1.80, ph $1.80 PB 129 645

Acoustics

Engineering Research Inst., U. of Michigan, Ann Arbor.
WHAT IS MASKING? by W. P. Tanner, Jr. Dec 57, 14p. Contract AF 19(604(2277; Rept. no. 2659-3-T; AFCRC TN 57-64; AD-146 757. Technical mem. no. 52
Order from LC mi $2.40, ph $3.30 PB 134 394

Three experiments are presented and analysed in terms of a conventional definition of masking and a masking index conforming to this definition.

Material Lab., New York. Naval Shipyard, Brooklyn.
EFFECT OF PAINT ON ABSORPTION COEFFICIENT OF ACOUSTICALLY TREATED SURFACES, by M. Rosenfeld. Final rept. Mar 56, 12p. Lab. Proj. 5577-1; AD-111 863.
Order from OTS 50 cents PB 131 836

An evaluation was conducted to determine what change in sound absorption coefficient would result from painting the surfaces of two types of acoustically treated panels, one having a 1/2 inch air space between the acoustic material and the perforated aluminum sheathing and the other having no air space. The results indicated that five coats of a chlorinated rubber base paint applied on either panel would have negligible effect on their sound absorption coefficients.

Minnesota U., Minneapolis.
STUDY OF NOISE IN GAS DISCHARGES, by A. van der Ziel. Rept. for 15 Dec 55-23 Feb 57. Feb 58, 63p. 59 refs. Contract AF 33(616)3337; WADC TR 57-409; AD-151 094.
Order from LC mi $3.90, ph $10.80 PB 135 051

The study of noise in gas discharges was undertaken to obtain information about the basic mechanisms causing the noise. Such information may help to gain a better insight into the physics of the gas discharge and is important for the design of gas discharge noise sources. One of the main results of the research project was that noise measurements alone do not give much insight, but that a combination of noise and impedance measurements can give a much better understanding of the mechanisms involved. This method was particularly successful in the case of voltage regulator tubes; here the experimental results allowed the development of a theory that can explain most of the observations.

National Advisory Committee for Aeronautics, Washington, D. C.
TURBOJET ENGINE NOISE REDUCTION WITH MIXING NOZZLE-EJECTOR COMBINATIONS, by Willard D. Coles, John A. Mihaloew and Edmund E. Callaghan. Aug 58, 33p.
Order as TN 4317 from National Aeronautical and Space Administration, 1520 H St., N. W. Washington 25, D. C.

Maximum sound pressure level reductions of 12 decibels and sound power level reductions of 8 decibels were obtained with lobe nozzle and ejector combinations on two full-scale engines. The ejectors provided 3 to 5 decibels of sound power level reduction. Several combinations of ejectors and nozzles were used and acoustic and engine performance data are presented. A study of jet profiles and boundaries at the ejector exit shows the effectiveness of the lobe nozzle and ejector combinations in diffusing the jet to a larger, lower velocity stream. Calculated noise reductions based on ejector exit flow conditions are not realized experimentally, probably because the noise generated inside the ejector is appreciable.

Psycho-Acoustic Lab. Harvard U., Cambridge, Mass.
PERIODIC STATUS REPT. NO. 29, 16 NOV 1956-15 MAY 1957. 15p. Contract Nonr-1866(15). Continuation of Contract N5ori-76(2); PNM-76.
Order from LC mi $2.40, ph $3.30 PB 134 461

Electricity and Magnetism

Carnegie Inst. of Tech., Pittsburgh, Pa. and Michigan. University, Ann Arbor, Mich.
CONTRIBUTION TO THE QUANTUM THEORY OF ELECTRICAL TRANSPORT PHENOMENA, by W. Kohn and J. M. Luttinger. [1955] 67p. Contract Nonr 122415; In cooperation with U. of Michigan.
Order from LC mi $3.90, ph $10.80 PB 133 232

The usual theories of electrical conductivity suffer from a number of weaknesses. This paper attempts, on the basis of a simple model, to put the theory on as rigorous a basis as possible. A technique is developed which gives the entire density matrix of the system of charge carriers in the steady state.

Gordon McKay Lab. of Applied Physics, Harvard U., Cambridge, Mass.
FERROMAGNETIC RESONANCE IN SOME POLYCRYSTALLINE RARE EARTH GARNETS, by G. P. Rodrigue, J. E. Pippin and others. July 57, 32p. Scientific report no. 11; Contract AF 19(604)1084; AFCRC TN 57-574; AD 117 298.
Order from LC mi $3.00, ph $6.30 PB 132 053

Ferromagnetic resonance measurements have been carried out on a series of polycrystalline garnets of composition $5Fe_2O_3 \cdot 3M_2O_3$ with M = Y, Sm, Gd, Dy, Ho, Er, and Yb, from 20°C to the Curie points (approximately 280°C). Y, Yb, and Sm garnets have g-values of approximately 2.0 at room temperature while those of Dy, Ho, and Er are appreciably less than 2.0. Several technical applications in which these materials might be particularly advantageous are discussed.

Gordon McKay Lab. of Applied Physics, Harvard U., Cambridge, Mass.
PREPARATION OF POLYCRYSTALLINE FERROMAGNETIC GARNET MATERIALS FOR MICROWAVE APPLICATIONS, by W. P. Wolf and G. P. Rodrigue. July 57, 14p. Scientific report no. 9. Contract AF 19(604)1084; AFCRC TN 57-572; AD 117 296.
Order from LC mi $2.40, ph $3.30 PB 132 055

A simple chemical method is described for preparing high density, polycrystalline, magnetic garnets suitable for microwave applications, having the formula $3M_2O_3 \cdot 5Fe_2O_3$, where M is a rare earth from Sm to Lu, or yttrium.

Laboratories for Research and Development, Franklin Inst., Philadlephia, Pa.
RESEARCH ON FINE-PARTICLE PERMANENT MAGNET MATERIALS, by Ami E. Berkowitz and William J. Schuele. Final rept. for 1 Mar 57-28 Feb 58. Apr 58, 56p. Contract AF 33(616)5041; Rept no. F-2033-1; WADC TR 58-136; AD-155 760.
Order from OTS $1.50 PB 151 262

Ferromagnetic and ferrimagnetic fine particles were prepared by suitably heat-treating co-precipitated oxalates. The oxalate systems discussed in this report are the Co-Fe, Ni-Fe, and Cu-Fe systems in a wide range of compositions. The particles produced by this method included metals, alloys, ferrites, and other oxides. The particle sizes, depending on the heat treatment, included the superparamagnetic single domain and multidomain sizes. X-ray diffraction was used to determine the phases present in the oxaltes and their heat-treated products. Measurements were made of saturation magnetization, coercive force, and remanence at room temperature and (in a number of cases) at -196°C. Electron micrographs were obtained to determine structural properties such as size, shape, and degree of sintering. These magnetic and structural data were analyzed in terms of the theory of ferromagnetic fine particles.

Materials Research Lab., Watertown Arsenal Lab., Mass.
FRACTION OF TOTAL ENERGY OF MAGNETIC ORDER AND ENTROPY OF MAGNETIC ORDER ATTAINED AT THE CURIE TEMPERATURE BY

ANTIFERROMAGNETIC SALTS, by Arthur Paskin. Dec 56, 15p - Rept. no. 25.
Order from LC mi $2.40, ph $3.30 PB 133 530

Recent magnetic calculations are extended to obtain the fraction of the total energy of magnetic order and the fraction of the total entropy of magnetic order realized at the Curie temperature.

Molecular Physics and Spectroscopy

Purdue U. Lafayette, Ind.
ISOTOPIC SHIFT AND HYPERFINE STRUCTURE OF SPECTRAL LINES, by K. W. Meissner. Final rept. 1 Jan 52-15 July 56. Jan 57, 8p. Contract N70nr-39421.
Order from LC mi $1.80, ph $1.80 PB 133 331

Summarizes four papers published uring the contract period: 1. Selection of optimal spacers in Perot-Fabry interferometry. 2. Hyperfine structures of the resonance lines of indium (In^{155}). 3. Precision wavelength and isotopic shift measurements of germanium arc lines. 4. Interferometric wavelength measurements of germanium lines of a hollow cathods discharge.

Texas U. Austin,
PHASE CHANGES AND SPECTRAL SHIFTS, by W. W. Robertson and S. E. Babb, Jr. [1957] 12p. Contract AF 49(638)35; AFOSR TN 57-660; AD-136 654.
Order from LC mi $2.40, ph $3.30 PB 133 343

The absorption spectrum of benzene has been obtained in the diluents carbon dioxide, ethylene and ethane over a wide range of densities both above and below the critical temperatures. These results support the view that gases and liquids are essentially the same thing in those cases where specific interactions are not involved and suggest further that the radial distribution function remains constant from low to high densities of gas and into the liquid state.

Optics

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
APPARENT SIZE OF OBJECTS VIEWED THROUGH TELESCOPES, by James M. Vanderplas. Oct 54, 22p. WADC TR 54-459; AD-75792.
Order from OTS 75 cents PB 131 694

This report reviews several factors, inherent in the design of optical systems, which might conceivably operate to produce apparent size and distance alterations. Some phenomena of visual preception of size and distance are discussed and these phenomena are related to factors in the design of sighting telescopes for accurate perception of size and distance. Several possible theoretical approaches are suggested to the solution of the problem of object appearance when viewed through telescopes and periscopes.

Pennsylvania U., Philadelphia.
EFFECT OF PRESSURE AND TEMPERATURE ON THE INTRINSIC OPTICAL ABSORPTION OF GERMANIUM, SILICON, TELLURIUM, by L. J. Neuringer. Thesis, June 57, 98p. Contract N6onr 249(14); Technical rept. no. 13.
Order from LC mi $5.40, ph $15.30 PB 134 346

Measurements have been made of the effect of hydrostatic pressure upon the intrinsic optical absorption of germanium, silicon and tellurium in the range 1-2000 atmospheres. Also, the temperature variation of the absorption edge has been measured for silicon and tellurium in the range $90^{o}K < T < 420^{o}$. In addition the thermal dilation and electron-lattice interaction terms are deduced from the measured values of the temperature and pressure coefficients of each of the materials studied.

Solid State Physics

Air Force, Inst. of Tech. Dayton, Ohio.
EFFECTS OF NUCLEAR RADIATION ON SEMICONDUCTOR MATERIALS AND DEVICES, by Robert D. Larson. Thesis. Mar 58. 72p.
Order from LC mi $4.50, ph $12.30 PB 134 674

An attempt is made in this report to shed some light on the methods by which nuclear irradiation produces defects in semiconductor materials, and to relate these defects to the electrical properties of the materials. The importance of some of the affected properties on device operation is also mentioned.

Carnegie Inst. of Tech. Pittsburgh, Pa.
ON THE PRINCIPAL FREQUENCY OF A MEMBRANE, by Zeev Nehari. Nov 57, 13p. Contract AF 18(600)1138; Technical rept. no. 20; AFOSR TN-57-713; AD-136 706.
Order from LC mi $2.40, ph $3.30 PB 133 319

This paper is concerned with the possible generalizations of Rayleigh's theorem to the case of non-homogeneous membranes. It is clear that no general result of this type is to be expected unless certain restrictions are imposed on the density distribution of the membrane. It is easily shown that the principal frequency of a membrane of given mass can be made arbitrarily small if enough of the mass is concentrated in a small area interior to D . It is therefore necessary to add conditions which prevent the excessive accumulation of mass at interior points of the membrane.

Case Inst. of Tech. Cleveland, Ohio.
CALCULATION OF THE ELASTIC SHEAR CONSTANTS OF THE ZINC BLENDE STRUCTURE, by D. Allen Cohen. Thesis. July 57, Contract Nonr-1141(03); Technical rept. no. 23.
Order from LC mi $2.70, ph $4.80 PB 134 969

The total energy of valence electrons and ion cores arranged in the zinc blende structure was found to separate into three terms, a Coulomb term, a Fermi energy term, and the kinetic energy of the lowest state. The results for diamond compare favorably with experiment, assuming a reasonable value for the fraction of charge in the "bond" resion.

Columbia U., New York
INVESTIGATIONS IN THE MATHEMATICAL THEORY OF VIBRATIONS OF ANISOTROPIC BODIES, by R. D. Mindlin, E. G. Newman, and H. Deresiewicz. Final rept. 1 July 55-30 June 56. July 56, 97p. Contract DA 36-039-SC-64687; CU 4-56-SC-64687.
Order from LC mi $5.40, ph $15.30 PB 134 965

These studies fall into four categories: I. Approximate methods of analyzing high-frequency vibrations of crystals. II. Studies of solutions of the three-dimensional equations, including computation of roots of Rayleigh's transcendental equation governing the vibrations of an infinite, isotropic plate, and the analysis and computation of roots of Ekstein's transcendental equation. III. Study of simple solutions of the equations of motion of crystals applicable to rectangular prisms and plates. IV. Thermodynamic aspects of the behavior of piezoelectric crystals.

Harshaw Chemical Co., Cleveland, Ohio.
CADMIUM SULFIDE SOLAR GENERATOR, by David A. Hammond, Fred A. Shirland, and Richard J. Baughman. Rept. for 15 Feb 56-31 Dec 57. 136p. Contract AF 33(616)3466; WADC TR 57-770; AD-151 036.
Order from OTS $2.75 PB 151 276

Since last year, the efficiency of CdS photovoltaic cells has been increased to a range of 3 to 5%, from an average of 0.4%. This has been effected by improved doping, growth, cleaning, and electroding techniques. Two small solar energy generators were assembled from such cells for demonstration and testing purposes. Each of these gave about 50 milliwatts of power at about 6 - 7 volts when illuminated by direct sunlight.

U. of Utah, Institute for the Study of Rate Processes, Salt Lake City.
ETCHING OF DISLOCATIONS IN CORUNDUM, by Robert J. Scheuplein, J. Lambert Bates, and others. June 57, 4p. Contract Nonr-1288(03). Technical rept. no. 1.
Order from LC mi $1.80, ph $1.80 PB 134 531

Triangular etch pits about one micron across, corresponding to individual edge dislocations, have been observed in aluminum oxide single crystals after about five minutes' immersion in boiling phosphoric acid. The etched surfaces are shown after flame polishing, deformation, and at various stages of polygonization.

Mass. Laboratory for Insulation Research, Cambridge.
INVESTIGATIONS OF THE FERRITE REGION OF THE PHASE DIAGRAM Fe-Co-0, by J. Smiltens. Thesis. Jan 57, 23p. Contracts AF 30(635)2872 and Nonr-184110; Technical rept. no. 115.
Order from LC mi $2.70, ph $4.80 PB 133 325

The cobalto-magnetite phase at 1200°C, in a mixture of 98.13 vol. % CO_2 and 1.87 vol. % c0, is stable from x = 0 to 55.8, where x indicates the atoms of cobalt substituted for iron according to the formula $Co_xFe300\text{-}x0400$. In pure oxygen the stability interval reaches from x = 92.8 to 120. Cobalt does not substitute for iron in the hematite phase (1200°C).

Mass. Laboratory for Insulation Research, Cambridge.
SYSTEM FOR ELECTRICAL MEASUREMENTS ON SMALL CRYSTALS UNDER HIGH PRESSURES, by P. W. Forsbergh, Jr. and G. J. Wolga. Oct 56, 5p. Contract Nonr-1841(10); Technical rept. no. 111.
Order from LC mi $1.80, ph $1.80 PB 133 846

A high-pressure system for electrical measurements is described, which uses a new type of seal. The pressure vessel is simple in construction and can be considered readily expendable, thereby allowing a greater range of useful pressures. The seal is effective for work at the highest pressures at which a vessel without external support can be used (15,000 atm. or higher, depending on the material and treatment of the vessel).

Materials Research Lab. Watertown Arsenal Labs., Mass.
IRRADIATION EFFECTS ON CRYSTAL SURFACES, by J. J. Antal. June 58, 15p. Rept. no. 39.
Order from LC mi $2.40, ph $3.30 PB 135 103

A review is made of the work published or otherwise reported concerning the effects of radiation on the crystal structure of solid surfaces. An analysis of the various experimental techniques which are available for surface structure studies is made with regard to their applicability in irradiation effects studies.

Materials Research Lab. Watertown Arsenal Labs., Mass.
USE OF NUCLEAR MAGNETIC RESONANCE FOR

RADIATION EFFECTS STUDIES, by P. Sagalyn. July 58, 12p. Rept. no. 36
Order from LC mi $2.40, ph $3.30 PB 135 102

Damage produced in a crystal lattice by radiation can produce changes in the electrical and magnetic environment of the atomic nucleus. These changes can sometimes be detected by their effect on the nuclear magnetic resonance signal. This method of studying radiation damage will be discussed with particular reference to nuclear electric quadripole effects in metals.

Oregon State Coll. Corvallis.
CHEMICAL DETERMINATION OF THE OSCILLATOR STRENGTH OF F-CENTERS, by Allen B. Scatl and Marian E. Hills. June 57, 11p. Contract N7onr-37(03); Technical rept. no. 8.
Order from LC mi $2.40, ph $3.30 PB 135 271

Palermo U., Italy.
CRYSTAL PLASTICITY. I: A THEORY OF GLIDE IN METAL CRYSTALS, by David A. Aboav. Dec 57, 66p. Contract AF 61(514)1078; Technical note no. 1; AFOSR TN 58-170, AD-152 197.
Order from OTS $1.75 PB 131 759

The inadequacy of the classical theory of elasticity is briefly discussed and an attempt is made to describe a geometrically perfect lattice whose elements are not identical. Each lattice-element is assumed to possess a characteristic property, its "state", in terms of which the internal energy, temperature and entropy are tentatively defined, and these assumptions are used as a basis for a theory of glide in metal crystals. The theory accounts for the existance of a critical shear stress, work-hardening and recovery, and predicts a creep behaviour closely resembling that observed in practice.

Thermodynamics

Amherst Coll. Mass.
THERMODYNAMIC PROPERTIES OF THE ELECTRICAL DOUBLE LAYER: DISCRETENESS-OF-CHARGE-EFFECTS IN THE INNER REGION OF THE ELECTRICAL DOUBLE LAYER, by Daivd C. Grahame. June 57, 26p. Contract Nonr-2309(01); Technical rept. no. 1, 2nd series.
Order from LC mi $2.70, ph $4.80 P3 134 990

The effects of the discreteness of adsorbed ionic charge in the electrical double layer have been examined. The formula of Esin and Shikov for the ration of the micropotential to the macropotential has been confirmed. In agreement with Ershler (Zhur. Fiz. Khim. 20, 679 (1946) it is concluded that if one neglects the multiple reflection of adsorbed ions between the outer Helmholtz plane and the metallic surface, a contradiction with experiment appears. An adsorption isotherm for anions on a metallic or air-solution interface has been derived and methods found for the evaluation of the potential of the inner Helmholts plane.

Applied Physics Lab., Johns Hopkins, Silver Spring, Md.
METHOD OF TEMPERATURE MEASUREMENT OF INCIPIENT FLAME KERNELS, by H. L. Olsen, E. L. Gayhart and L. W. Bennett. Aug 54, 41p. Contract N0rd-7386; CM-815
Order from LC mi $3.30, ph $7.80 PB 134 448

A technique, utilizing a thermocouple, has been devised for the measurement of the gas temperature within spark-ignited incipient flame kernels. The method not only measures temperature but permits observations to be made of the dependence of flame-kernel temperature on time for laminar flames; effects of turbulent flow on flame temperature and flame speed in incipient turbulent flame kernels can also be surveyed.

Armour Research Foundation, Chicago, Ill.
STUDY OF EFFECTS OF TURBULENCE PROMOTERS ON HEAT TRANSFER, by A. Shaffer, O. E. Teichmann and others. Final rept. Aug 50, 79p. 252 refs. Contract W33-038-ac-14801; NEPA 1559; AD-22 540.
Order from LC mi $4.50, ph $12.30 PB 134 467

This report is the summary of a literature survey and analytical study of the effect of turbulence promotion on forced convection heat transfer and fluid friction. Studies were made of the flow in smooth, rough and baffled tubes and in plate-fin heat exchangers. Available information indicates that smooth tubes give the best performance on a heat transfer-pressure drop basis. Turbulence promotion by any of the means studied increases the heat transfer capacity of a given system, but extraneous friction losses due to the increased turbulence are so large as to make operation in this manner unfavorable. Plate-fin heat exchangers, with devices for boundary-layer interruption, are less efficient than smooth tubes if comparison is made on the basis of transfer area. Because of their compactness, however, they may be more efficient if comparison is made on the basis of exchanger volume. The report consists of two sections: Part 1, a discussion of the technical aspects of the problem, with conclusions derived from the survey; and Part 2, an annotated bibliography covering the literature consulted in the survey.

Institute for Cooperative Research, Johns Hopkins U. Baltimore, Md.
BOSE-EINSTEIN GAS IN A GRAVITATIONAL FIELD, by H. A. Gersch. Mar 57, 6p. Contract Nonr-248(10).
Order from LC mi $1.80, ph $1.80 PB 132 650

Jet Propulsion Lab., Calif. Inst. of Tech. Pasadena.
PHOTOGRAPHIC STUDY OF BUBBLE FORMATION IN HEAT TRANSFER TO SUBCOOLED WATER, by Fred C. Gunther and Frank Kreith. Mar 50. 28p. Contract W04-200-ORD-455; Rept. no. 4-120.
Order from LC mi $2.70, ph $4.80 PB 134 793

Miami U., Coral Gables, Fla.
RELATIVISTIC KRONIG-PENNY MODEL, by R. D. Woods and J. Callaway. May 57, 15p. Contract Nonr 640(06); Technical rept. no. 5.
Order from LC mi $2.40, ph $3.30 PB 133 589

A one-dimensional model of a crystal is studied using the Dirac equation. The energy bands for a square well and a delta function potential are calculated. The transcendental equation relating energy to wave number has the same general form as in the non-relativistic case. The difference is only in the dependance of the coefficients and arguments on energy, which is characteristic of the Dirac equation. Expressions for the width of the energy bands and energy gaps associated with the delta function potential are obtained.

National Advisory Committee for Aeronautics, Washington, D. C.
REVIEW OF THE THERMODYNAMIC, TRANSPORT, AND CHEMICAL REACTION RATE PROPERTIES OF HIGH-TEMPERATURE AIR, by C. Frederick Hansen and Steve P. Heims. July 58, 33p.
Order as TN 4359 from National Aeronautical and Space Administration, 1520 H St., N. W. Washington 25, D. C.

Thermodynamic and transport properties of high-temperature air, and the reaction rates for the important chemical processes which occur in air, are reviewed. Semiempirical, analytic expressions are presented for thermodynamic and transport properties of air. Examples are given illustrating the use of these properties to evaluate (1) equilibrium conditions following shock waves, (2) stagnation region heat flux to a blunt, high-speed body, and (3) some chemical relaxation lengths in stagnation region flow.

Wave Propagation

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
INTERPRETATION OF RADIO POLARIZATION DATA IN TERMS OF FARADAY ROTATION, by M. H. Cohen. May 56, 22p. Contracts AF 19 (604)73 and N6onr-264(06); Research rept. EE 295; Radion astronomy and solar radio noise joint rept. no. 3.
Order from LC mi $2.70, ph $4.80 PB 133 594

A simple graphical presentation of Hatanaka's theory of Faraday dispersion due to finite receiver bandwidth is made. Two-frequency and two-bandwidth experiments to measure dispersion are considered, and the analysis of a two-bandwidth experiment is discussed in detail.

Institute of Engineering Research, U. of Calif., Berkeley.
DIFFRACTION OF A PLANE ELECTROMAGNETIC WAVE BY A CIRCULAR APERTURE AND COMPLEMENTARY OBSTACLE. PART I: HIGH FREQUENCY APPROXIMATION, by Samuel Silver and Morris J. Ehrlich. Dec 51, 14p. Contract N7onr-29529; Technical rept. no. 13; Series 7, Issue 181; AT1-167 966.
Order from LC mi $2.40, ph $3.30 PB 134 425

Studies have been made of the near zone diffraction field over a rather wide range of aperture and obstacle dimensions and a fairly comprehensive picture of the phenomena that are involved can now be drawn. This work makes it possible to evaluate the various small hole theories and the Kirchhoff type of high frequency approximation. A new high frequency solution has been developed on the basis of a Fourier integral method given previously by Silver. The solution is in good agreement with experiment over most of the range of dimensions that was covered by this study.

Institute of Engineering Research, U. of Calif., Berkeley.
DIFFRACTION OF A PLANE ELECTROMAGNETIC WAVE BY A CIRCULAR APERTURE AND COMPLEMENTARY OBSTACLE. PART II: DISCUSSION OF EXPERIMENTAL RESULTS, by Samuel Silver, Morris J. Ehrlich, and G. Held. Sep 52. 37p. Contract N7onr-29529. Technical rept. no. 17; Series 7, Issue 185; AD 5105.
Order from LC mi $3.00, ph $6.30 PB 134 348

This report is devoted to experimental studies of diffraction of electromagnetic waves by a circular aperture and to an evaluation of certain theoretical developments. All available theoretical results are fundamentally in the nature of approximations for the two extremes of the size of the aperture (or obstacle) relative to the wavelength, the very large and the very small. (See also PB 134 425)

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
ANALYSIS OF CIRCULAR WAVEGUIDE MODES, by Leopold B. Felsen. Final rept. May 56, 41p. Contract DA 36-039-SC-64424; MRI R 484-56; PIB 414
Order from LC mi $3.00, ph $7.80 PB 134 539

The research on this contract has been concerned with a theoretical and experimental investigation of propagation of electromagnetic waves in uniform waveguide regions capable of supporting

several propagating modes, with special application to circular waveguides. The theoretical aspect comprises three main phases: a) investigation of mode characteristics in ciruclar waveguides. b) description of lumped discontinuities in multimode waveguides, and c) propagation through two or more isolated discontinuities in multimode waveguides.

Radiation Lab., Columbia U., New York.
RESEARCH INVESTIGATION DIRECTED TOWARD EXTENDING THE USEFUL RANGE OF THE ELECTRO MAGNETIC SPECTRUM, by P. Kusch. Quarterly progress rept. no. 6, 16 Mar-15 June 57. June 57, 41p. Contract DA 36-039-sc-64630; CU-7-57-sc-64630.
Order from LC mi $3.30, ph $7.80 PB 133 318

Washington Square Coll., New York, N. Y.
STUDY OF THE GENERATION AND DETECTION OF ELECTRO MAGNETIC WAVES IN THE MILLIMETER WAVE REGION, by J. H. Rohrbaugh. Rept. no. 5, 1 June-31 Aug 56. Sep 56, 27p. Contract AF 19 (604) 1115; AFCRC TN 56-772; AD 110 104.
Order from LC mi $2.70, ph $4.80 PB 133 288

The theoretical analysis of spectral intensities for the echelette grating has been extended by developing a boundary condition calculation for the case of radiation plane polarized at right angle to the groove direction. Numerical calculations from this, for the previously reported experimental conditions, lead to results that are in very good agreement with experiment but only slightly better than those from the formula reported previously. Progress is reported on crystal analysis, a new system for experiments on a magnetron with an inhomogeneous magnetic field, and on the construction of the new spectrometer. (See also PB 116 645, 116 990, 117 767, 119 237)

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

Battelle Memorial Inst., Columbus, Ohio.
PREPARATION OF LITHOGRAPHIC PLATES BY XEROGRAPHY FOR THE REPRODUCTION OF MILITARY MAPS AND CHARTS, by P. F. Kurz, W. G. Thompson and others. Final progress rept. 3 Sep 56-2 Sep 57. 38p. Contract DA 44-009-eng-3117.
Order from LC mi $3.00, ph $6.30 PB 135 279

The scope of the work on this project was: To conduct research on the application of xerography and other methods of electrostatic photography to the making of lithographic printing plates for reproducing military maps and charts in the field. Emphasis was on the improvement of methods and materials for using a xerographic plate directly as a lithographic printing plate.

SOCIAL SCIENCES

Stanford U., Calif.
NOTE ON DYNAMIC STABILITY, by Kenneth J. Arrow and Maurice McManus. June 57, 11p. Contract N6onr-251(33). Technical rept. no. 43.
Order from LC mi $2.40, ph $3.30 PB 134 347

In a recent issue of Econometrical (vol. 24, no. 3, p. 288-293, Jul 1956) A. C. Enthoven and K. J. Arrow are interested in a certain mathematical problem. Their theorem is that if A has non-negative off-diagonal elements, this being a generalized version of the type examined by L. A. Metzler, then DA is stable if and only if the diagonal elements of D are positve. The purpose of this note is to examine the same problem for certain other classes of matrices. The importance of the results to economic dynamics is discussed at the end of the paper.

Documentation

Diamond Ordnance Fuze Labs., Washington, D. C.
SYSTEM FOR REPORTING THE STATUS OF TECHNICAL PROJECTS, by Joseph M. Turner. July 57, rev. Mar 58, 21p. Technical rept. no. 471, rev.
Order from LC. mi $2.70, ph $4.80 PB 134 424

Documentation, Inc., Washington, D. C.
COMAC: AN EFFICIENT PUNCHED CARD COLLATING SYSTEM FOR THE STORAGE AND RETRIEVAL OF INFORMATION, by Mortimer Taube. Oct 57, 22p. Contract AF 49(638) 91; AFOSR TN 58-365.
Order from LC mi $2.70, ph $4.80 PB 135 268

Loss functions are given for which there exist optimal two-level ordering policies (s, S) in one-stage inventory problems with an arbitrarily specified distribution of demand.

MISCELLANEOUS

Columbia U., New York
SOME CASES OF OPTIMALITY OF THE (s, S) POLICY IN INVENTORY THEORY, BY A. Dvoretzky. Sep 57, 6p. Contract AF 18(600)442. AFOSR TN 58-9; AD-148 048.
Order from LC mi $1.80, ph $1.80 PB 133 355

Loss functions are given for which there exist optimal two-level ordering policies (s, S) in one-stage inventory problems with an arbitrarily specified distribution of demand.

Report of NRL progress. U.S. Naval Research Laboratory. Dec 1958. 55p. Order from OTS. $1.25. Also available at annual subscription rate of $10.00 a year in the U.S.A., foreign rate $13.00 a year. PB 151 333

Contents: Articles: Atmospheric Control in the True Submarine, by J. C. White. - Self-Luminous Sources of Light: Some Recent Developments and Applications, by L. J. Boardman. - Scientific program: Problem notes: Applications research: Naval data handling system pickoff display converter.... The CIC Facility at the Laboratory's Chesapeake Bay Annex. - Astronomy and astrophysics: Surface activity of fluorinated organic compounds at organic-liquid/air interfaces... Chemical-resistant silk screen inks for the manufacture of printed circuits.... Theoretical design of primary and secondary cells: effect of polarization and internal resistance on (a) current density distribution and (b) cell characteristics and cell design. - Mechanics: Thermoelectric power of indium substitutional alloys as a function of valence electrons per atom. - Metallurgy and ceramics: Stress-corrosion cracking of hardenable sheet steels.... Rupture strength of nickel specimens in elevated temperature environments.... Influence of temperature upon state or order in a 50%Ni-50%Fe alloy.... Intermittent effects of pile irradiation on the magnetic properties of a ferrite. - Nuclear and atomic physics: Angular correlations for the $B^{11}(He^3, d)C^{12*}(\ )C^{12}$ reaction at a bombarding energy of 4.5 Mev. - Optics: Visibility of stars at high altitudes (balloon heights). - Radio: Secondary emission electron multiplier tube.... Gray-wedge amplitude distribution analyzer rapidly reduces data on radar echo characteristics at frequencies in the L-, S-, and X-bands.... Some design considerations concerning linear arrays having Dolph-Tchebycheff amplitude distributions. - Solid-state physics: A method for calculating matching conditions in a three-level chromium-ion maser.... Production of color centers in sodium chloride crystals at low temperatures.... Study of some turbulent flow parameters for cooling fluids in high-powered magnets. - Published reports. - Papers by NRL staff members. - Patents. - Index of articles.

ATOMIC ENERGY COMMISSION REPORTS

Reports may be purchased in accordance with instructions on the inside front cover of the U. S. GOVERNMENT RESEARCH REPORTS. As PB numbers are not indicated, order by series and number. These reports may also be consulted at any AEC Depositoty Library. A list of these libraries may be obtained from the U. S. Department of Commerce, Office of Technical Services, Washington 25, D. C.

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Biology and Medicine

Uranium accumulation in plants as an indicator of uranium deposits in the soil. Final progress report, 1953-1955, by Edwin B. Kurtz, Jr. and Roger Y. Anderson. Univ. of Arizona. Coll. of Agriculture, Tuscon, Arizona. Mar 1956. Contract AT(11-1)-278. 24p. Order from LC. Mi $2.70, ph $4.80. AECU-3177

The absorption of fission products by plants, by J. H. Rediske and others. Hanford Atomic Products Operation. Richland, Wash. May 1955. Contract W-31-109-Eng-52. 16p. Order from LC. Mi $2.40, ph $3.30. HW-36734

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Chemistry—General

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Recovery of U from recycle wastes, by I. R. Higgins. Oak Ridge National Lab. Oak Ridge, Tenn. Jun 1956. Decl. Mar 1957. Contract W-7405-eng-26. 14p. Order from LC. Mi $2.40, ph $3.30. CF-56-6-155

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Irradiation annealing in graphite. II. Activation processes, by J. R. Townsend and R. E. Nightingale. General Electric Co. Hanford Atomic Products Operation, Richland, Wash, Feb 1958. Decl. with deletions Mar 1958. Contract W-31-109-Eng-52. 10p. Order from LC. Mi $1.80, ph $1.80. HW-55211-RD(Del.)

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External environmental radiation measurements in the United States, by L. R. Solon and others New York Operations Office. Health and Safety Lab., AEC., New York, N. Y. Mar 1958. 35p. Order from LC. Mi $3.00, ph $6.30. HASL-25

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Zircex uranium sublimate loss, by T. R. Jaworowski and C. J. King, III. For Oak Ridge Gaseous Diffusion Plant. Massachusetts Inst. of Tech. Engineering Practice School, Oak Ridge, Tenn. Jan 1958. Contract W-7405-eng-26, subcontract no. 70. (KT-310). 23p. Order from LC. Mi $2.70, ph $4.80. AECU-3750

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Some experiments with aeration and agitation of carbonate leaching slurries, by Robert A. Eisenhauer and Galen W. Clevenger. National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass. Jun 1958. Contract AT(49-6)-924. 31p. Order from LC. Mi $2.70, ph $4.80. WIN-104

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Critical masses of oralloy in thin reflectors, by G. E. Hansen and others. Los Alamos Scientific Lab. Los Alamos, N. Mex. Jan 1958. Contract W-7405-eng-36. 33p. Order from LC. Mi $3.00, ph $6.30. LA-2203

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